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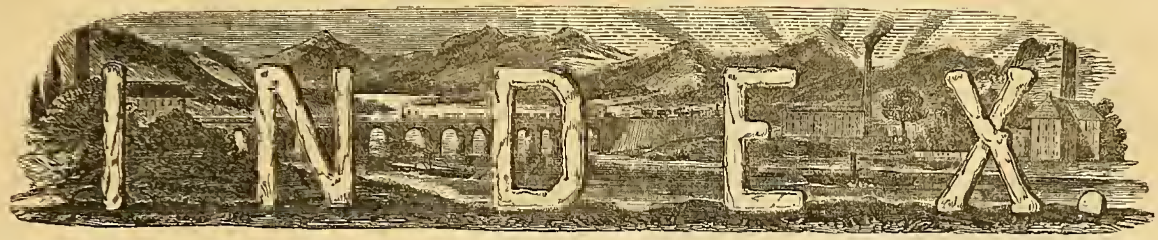

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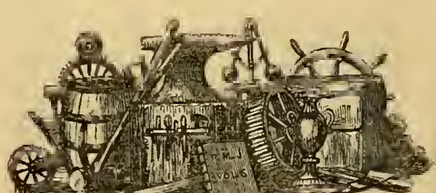

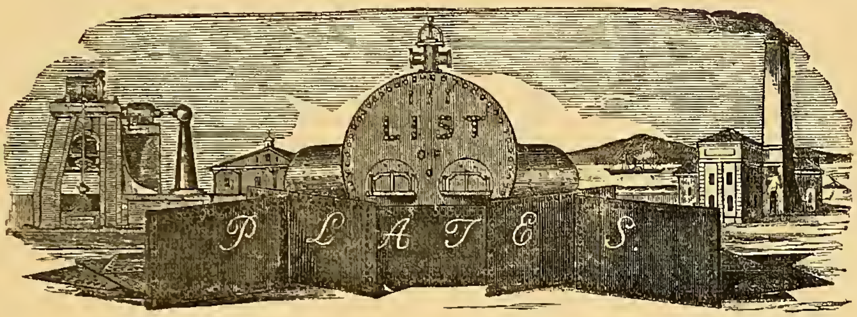

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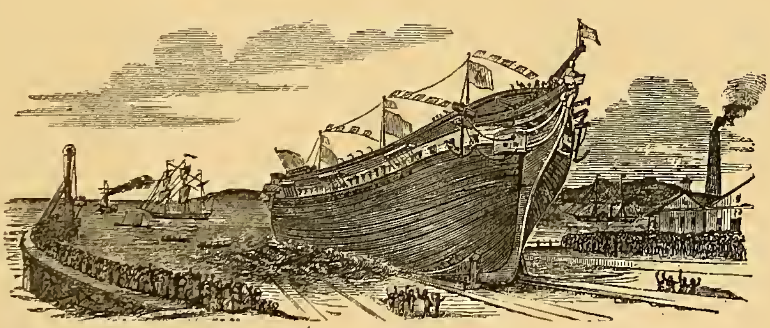

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RAILS &

H.L.CORLETT,

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Fig. 14.

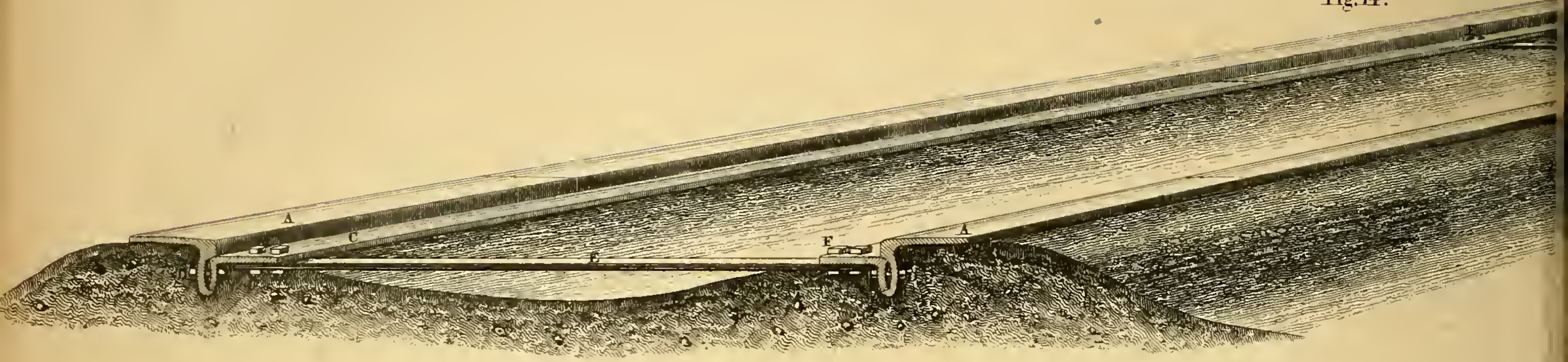
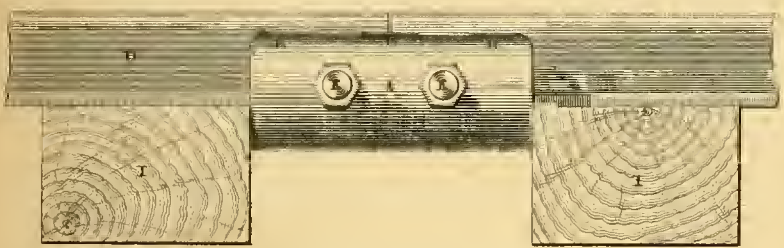


Fig. 1.



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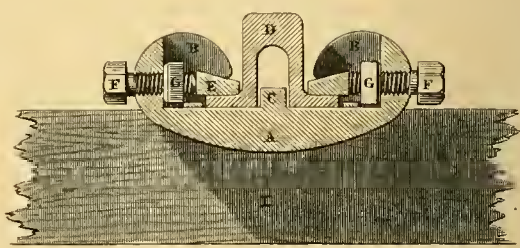

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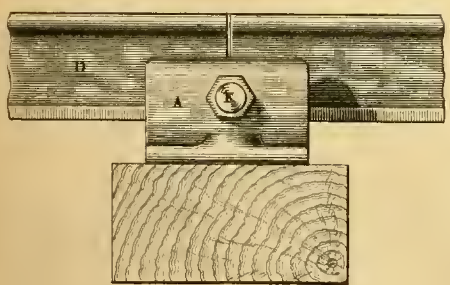

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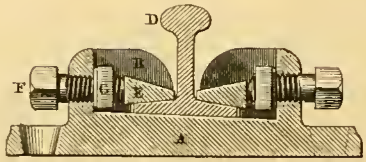

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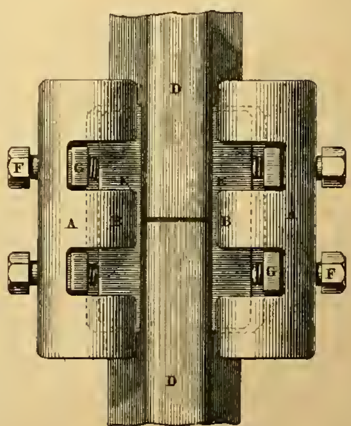

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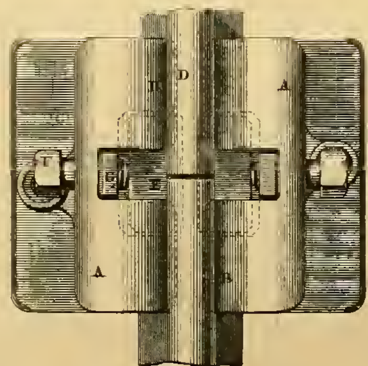

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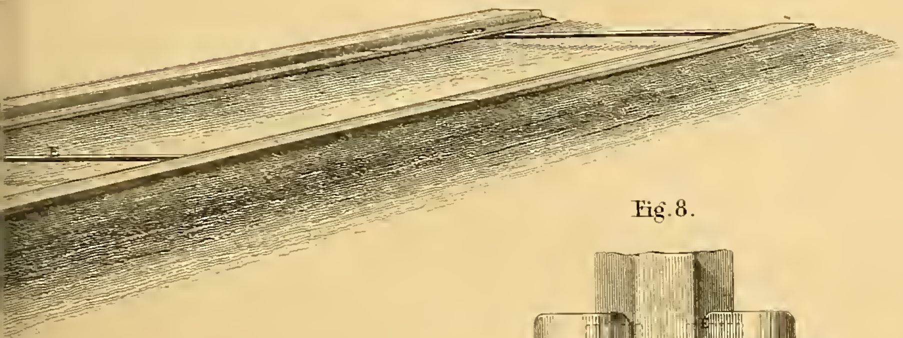

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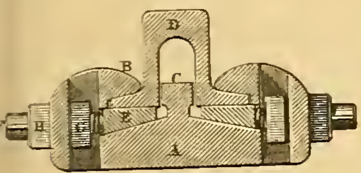

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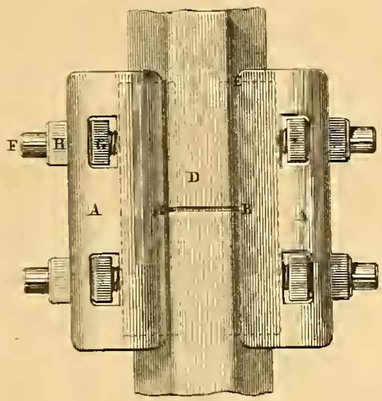

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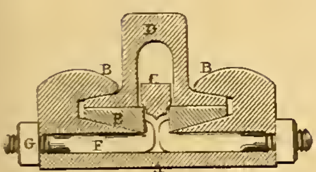

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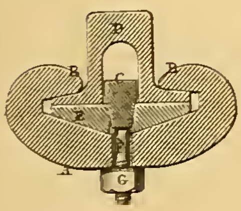

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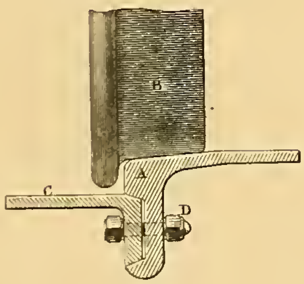

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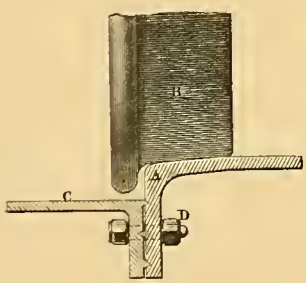

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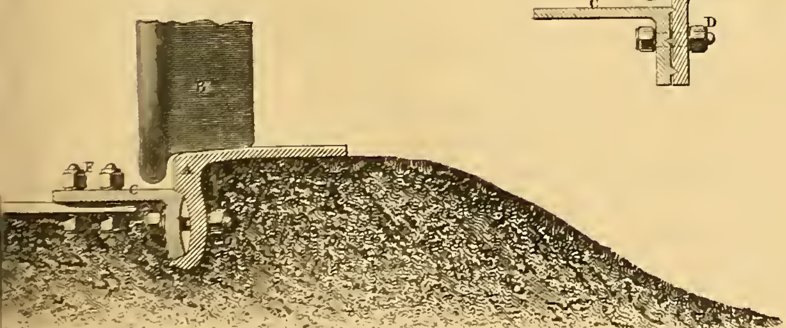

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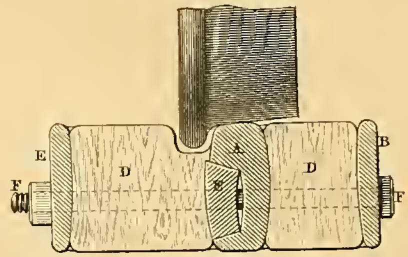


Fig.16.

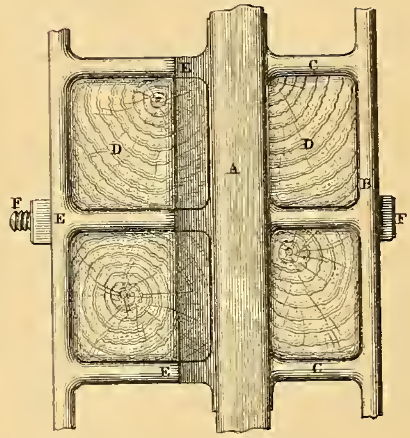
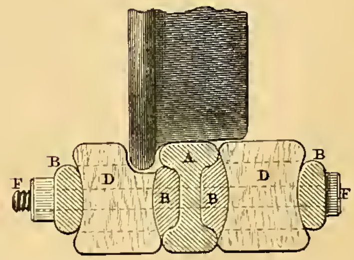


Fig.17.



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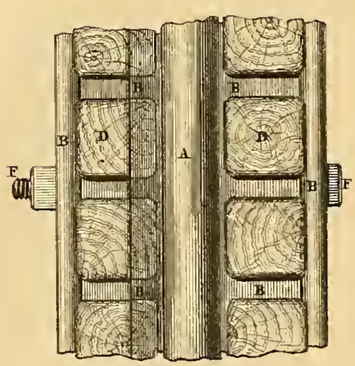

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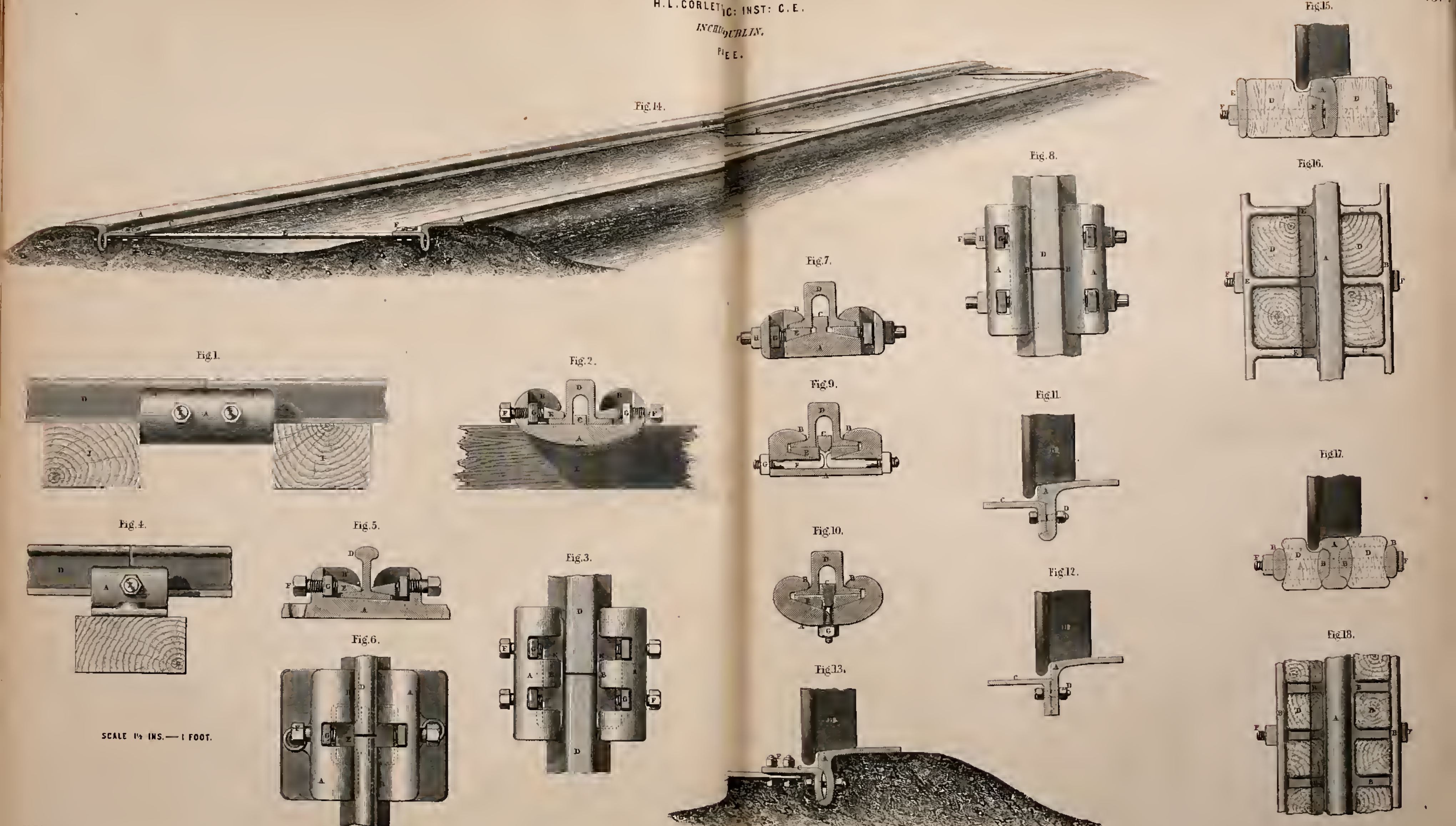
RAILS & RAILWAYS,

H. L. CORLETT, M. INST: C. E.

INCHICORE, DUBLIN.



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THE

PRACTICAL MECHANIC'S JOURNAL.

"How infinitely small are the triumphs of war by the side of the triumphs of peace! When one compares the results which have been obtained by scientific men, with those of mere statesmen and soldiers, it is impossible not to see that in the end, the bias of human affairs depends on something else than policy and wars. The machinery employed in cotton spinning has imparted a fresh tone to English society, and modified the character of the nation. The improvements in the working of iron have gone far to give to England her character and position amongst nations. The railroad, and the screw steamship, and the electric telegraph, are at the present moment changing the apparent destinies of the human race."—"Times" Newspaper.

RAILS AND RAILWAYS.

By H. L. Corlett, Esq., Assoc. Inst. C.E., *Inchicore, Dublin.*

(Illustrated by Plate 254.)

The continued improvements in the practice of forming and laying rails for steam locomotive purposes have proved, after the improvements in the steam engine itself, to be the greatest and most important mechanical facts of our time. Railways have long since grown into necessities, without which the human family cannot carry on the business of existence; and it may be said that no department of mechanical construction has received more attention in the present day from those who are thoroughly practical men, in every sense of the expression, than that which comprehends our iron ways, and the steam engines which perform such marvels upon them.

Mr. H. L. Corlett, of the well-known Irish railway establishment of the Great Southern and Western line at Inchicore, near Dublin, is amongst the latest of our engineers who have devoted their practical knowledge to the substantial improvement of what is technically called "permanent way," whether for main locomotive lines or those which must, sooner or later, be extensively laid on common roads.

Fig. 1, on our plate 254, is an elevation of one modification of Mr. Corlett's improved railway chair; fig. 2, is a transverse vertical section; and fig. 3, a plan of the same. The chair, A, is by preference made of cast-iron; the lower part is curved, as shown in the transverse section; the lateral extremities are of an elliptical figure, and from this part extend inwards, forming the overhanging lugs, B. With this arrangement, there is a recess or cavity formed on each side of the chair, between the floor or bearing surface and the under side or lower surface of the lugs, B. A longitudinal rib or feather, C, is formed along the centre of the chair; this rib is made to fit the hollow portions of the bridge rails, D, and serves to keep the ends of the rails accurately in line with each other. The ends of the rails, D, are placed in close contact with each other, the under surfaces of the rails resting firmly on the floor of the chair; they are firmly secured in this position by means of the tapered or wedge-shaped keys, E. The under sides of the lugs, B, are inclined to suit the angles of the keys, E, which are placed in the chairs with their thinner ends directed towards the rails, D. In this way the under surface of each key presses upon and holds firmly down the foot of each contiguous rail, whilst the upper surface of the key presses against the overhanging lug. To prevent these keys from shifting either laterally or outwardly, they are acted upon by the set screws, F—these screws pass through internal screws tapped in the sides of the chair; by this means the keys, E, may be tightened up to any desired extent by turning the screws. In lieu of forming the internal screws in the sides of the chair, they may be fitted to pass through the nuts, G, and so force the keys, E, inwards.

A modification of the improved railway chair, as adapted to foot rails, is shown in elevation in fig. 4, in transverse vertical section at fig. 5, and in plan at fig. 6. In this arrangement the chair, A, is made with a flat base to admit of its being bolted down to the sleeper. The lugs, B, are very slightly modified from the arrangement shown in figs. 1 to 3; the ends of the rails, D, rest on the chair, and are retained by the keys, E, which are tightened up by the screws, F, as before described.

Another mode of arranging the chair for bridge rails is delineated in figs. 7 and 8, fig. 7 being a transverse vertical section of the arrangement, and fig. 8 a plan corresponding. The floor or bearing surface of the chair, A, is made to form two inclined planes, which rise upwards towards the central rib, C. This rib is made as wide at the top as the recess in the rails, D, but is narrowed in at the lower part down to its junction with the inclined surfaces before referred to. The wedge-shaped keys, E, are in this arrangement placed below the ends of the rails, D, the inclined surfaces of the chair corresponding to the angle given to the lower sides of the keys. The upper surfaces of the keys are made flat, and upon these the ends of the lateral flanges of the rails, D, rest; the lateral flanges of the rails pass under the overhanging lugs, B. The wedges, E, are driven inwards by the screws, F, which may, if necessary, be provided with the jam nuts, H, as a further security against the shifting of the screws, arising from the vibration of the rails when trains are passing over them. In the arrangement shown in fig. 9, the chair, A, is similar in form to the modifications delineated in figs. 7 and 8, and the lower inclined faces of the keys, E, rest on the correspondingly inclined surfaces of the chair, but with their thinner edges reversed or directed outwards, the lateral flanges of the bridge rails, D, resting firmly upon the level surfaces of the keys. The tightening up of the keys so as to wedge the rails against the overhanging lugs, B, is effected by means of the bolts, F, the inner ends of which are turned upwards to form hooks, which press against the keys, E. The outer ends of the bolts, F, have fitted to them the nuts, G, the screwing up of which forces the keys outwards, so as to secure firmly the contiguous ends of the rails, D.

Fig. 10 represents a vertical section of another mode of arranging the means for tightening the keys. The chair, A, is similar in the configuration of its transverse section to that shown in fig. 2; the keys, E, are arranged as in the last modification, with their thinner edges outwards, and they are forced asunder by means of the bolts, F, which are made to pass through the wedge-shaped head, C, in a vertical direction between the keys. The screwing up of the nut, G, draws down the bolts and wedge, C, and gradually forces the keys apart so as to effectually secure the ends of the rails. These improved railway chairs may either be so arranged as to rest on the sleepers, I, beneath, or they may be laid on the ballast, or they may be simply suspended between the sleepers, the mode of attachment in either case securing a firm and effective junction of the rails.

Hitherto, iron rails have generally been made in convenient lengths of solid bars, which are secured in metal chairs resting on timber sleepers, the abutting ends of the rails being fixed by the keys, or by fish plates bolted on either side. The surface or "tread" of such rails being convex, and narrower in proportion than the coned peripheries of the wheels passing over them, present an insufficient amount of surface thereto; the result is, loss of power for want of adhesive surface, and rapid deterioration of both rails and wheel tyres. This entails the rapid destruction of the sleepers and other parts of the permanent way, as well as serious injury to the rolling stock, and a resulting limit to the speed at which trains can be safely worked.

Mr. Corlett's improvements render the use of sleepers, chairs, or fish plates unnecessary, at the same time the bearing surface or tread of the rail is increased and made to correspond to the conical form of the peripheries of the wheels, and the point of support is elevated to as near the top of the rail as is practicable, so as to secure a continuous and level surface combined with durability of structure and facility for executing repairs. Figs. 11, 12, and 13, represent vertical sections, showing three different modes of arranging and constructing the improved rail. In fig. 11, the rail, A, is made with a broad bearing surface or tread, extending outwards in a lateral direction, the angle to which the inner part of the bearing surface is formed being made to correspond to the periphery of the carriage wheel, B. The vertical web, or lower part of the rail, has a longitudinal channel or recess rolled in it, the upper and lower surfaces of which are slightly inclined. This channel or recess is intended to receive the vertical wing of the angle iron, C, which is rolled with a broad laterally extending surface. The vertical wing of the angle iron, C, fits into the channel of the rail, A, and the two parts are securely held together by the bolt and nut, D, the rails, A, and the angle irons, C, being so arranged as to break joint with each other. When these rails are laid in ballast, and held to gauge with suitable tie-rods, the lateral horizontal flanges act as a continuous support, and the vertical flange as a keel, to preserve the rails in their proper position.

In the modification shown in fig. 12, the web of the rail, A, and the wing of the angle iron, C, are curved slightly outwards, a mode of construction to which preference may in some cases be given. In lieu of the channels formed in the vertical web of the rails, as described and shown in the last two arrangements, the rails and angle irons may be fitted together, as shown in the sectional view, fig. 13, and in the perspective view, fig. 14. In this mode of fitting the parts together, V shaped wedges are formed on the web of the rail, and on the wing of the angle iron; these ridges fit into corresponding grooves formed opposite to the ridges either in the web of the rail or the wing of the angle iron. There are two ridges formed on the angle iron, and one on the web of the rail; but this arrangement may be variously modified according to circumstances, the main object being to prevent the vertical displacement of the rails, and so maintain the bearing surface as continuous and uniform as possible. When these improved rails are laid on common roads, either or both the lateral flanges may be made available as a tramway for ordinary carriages, as well as for the flanged wheels of railway carriages. The perspective view, fig 14, shows the arrangement of the rails, A and C; the tie-bars, E, are secured by bolts, F, to the opposite rails, and so serve to keep them at the proper distance asunder. In this manner of laying permanent way a uniformly level and superior line of rail is obtained with less ballast than would be required under ordinary circumstances, whilst, at the same time, the drainage is improved and the facilities for effecting repairs greatly increased.

The last part of the patentee's present invention consists of an improved mode of supporting rails by means of lateral cellular brackets, the cells of which are filled either with compressed timber, asphalt, concrete, broken stones, ballast, or other similar materials. Fig. 15 is a vertical section; and fig. 16, a plan of a portion of a rail arranged and constructed according to this system. The rails, A, are cast with a parallel longitudinal rib of metal, B, which is united to the rail by the transverse stays or connecting pieces, C, the spaces between which form a series of rectangular cells, open at the top and bottom. These cells are filled in with pieces of compressed wood, D, the end grain of the wood being presented to the surface, so that it may wear longer and at all times ensure its fitting tightly into the cell by reason of the lateral expansion. The vertical rib of the rail, A, is cast with a longitudinal channel or recess, to receive the inner part of the laterally supporting bracket piece, E, which is cast cellular like the outer part of the rail, A. The supporting bracket, E, is fitted to the rail, A, and the two are firmly connected together by the transverse bolts and nuts, F. The cells of the bracket, E, are filled in with compressed timber, D, or with any of the cheaper materials hereinbefore named. Instead of casting the rail, A, with a channel or recess in the vertical rib, both the parts may be made with projections and corresponding recesses to ensure their proper lateral adjustment.

Another mode of arranging this improved cellular railway is shown in transverse vertical section in fig. 16, and in plan in fig. 18. In this case the rail, A, is of the ordinary form, and it is supported on either side by the cellular brackets, B, the inner parts of which fit the web of the rail—the brackets and the rail being firmly secured by the transverse bolts and nuts, F. The interstices of the brackets are filled with blocks of compressed wood, D, or with other materials as before described. The cast-iron cellular pavement may, in some cases, be extended with advantage between the rails, as in level crossings on railways, or common roads or streets; in such cases the cast-iron frames must be cast of suitable dimensions, the cells being filled in as hereinbefore described. This kind of cellular pavement is also well adapted for use in railway stations and platforms; also for covering turntables, the crossings and pavement of streets and bridges, and for other similar purposes.

Railways and their sub-structures are costly works, but we cannot now do without them; and all late experience has shown how wonderful is the economy arrived at by their use. We are seeking, year by year, to diminish not only the first expenses, but, and perhaps more particularly, the wear and consequent working expenses. In Mr. Corlett's plans, we think, we may fairly assume that we have received improvements which involve both.

HISTORY OF THE SEWING MACHINE.

ARTICLE XXV.

William Smith, of the Adelphi, obtained a patent on the 19th of October, 1855, for "improvements in sewing machines," communicated to him from abroad.

These improvements consist, *firstly*, in producing the stitch known as the "*lock-stitch*," by means of an encased spool or bobbin caused to revolve horizontally on its own centre or axis (without a reciprocal motion in the line of its axis), in connection with a needle having a vertical motion. This spool rests and revolves on a ledge in a spool case holder, the ledge as well as the spool case being so constructed as not to interfere with the needle thread. The spool ease consists of a circular hollow bore of steel, having teeth on its outer edge. It has also on its edge a nose for catching the needle thread, resembling the nose of the shuttle in ordinary shuttle machines, the nose being arranged in connection with the ledge above referred to in such a manner, that as the case revolves the needle thread passes perfectly free. The spool is placed within the ease in such a manner that both revolve together, and an arm is placed, radiating from the centre of the spool, the movement of which is entirely independent of the spool or case, this movement of the arm being obtained from the spool thread which passes from the spool, through a hole in the end of the arm, and thence through another hole in the centre of the spool cap towards the material to be operated upon. The spool case, with its spool, is caused to revolve in the ledge within the holder, by means of the teeth on the periphery of the case gearing into the teeth of a wheel on a vertical shaft, which has an irregular or differential motion given to it by means of an elliptical toothed wheel, which gears into a similar wheel on the driving shaft, thereby causing the spool ease and spool to turn in such a manner that in some portions of a complete revolution it turns faster than at others, causing a dwell or hesitation, which, in conjunction with the movement of the needle, effects a full and complete stitch. Fig. 169 represents a section of the spool case and spool case holder detached from the machine, and fig. 170 is a plan of the spool case and spool cap. I, is the spool case having teeth formed on its external surface for the facility of driving the same. This spool case rests and revolves upon the ledge, K, within the holder, J, which is secured to the frame of the machine. L, is the point or nose formed on the external edge of the spool case, and interrupting the teeth formed thereon, this interruption corresponding with a similar recess or interruption in the periphery of the spur wheel which drives the spool case, by which arrangement no impediment is offered to the movement of the wheels and passage of the thread; M, is the spool, and N, the radial arm, which has a slight friction or drag given to it by means of the eentre screw, by turning which, the friction or drag may be inereased or diminished at pleasure.

Fig. 169.

Fig. 170.

The *second* part of this invention relates to a peculiar motion of driving a spool case, of a somewhat similar eonstruction to that above described, by placing the same in a stationary holder, within a cylindrical driver, the latter being eecentric to the former. In the cylindrical driver are teeth, which, as they revolve, catch alternately into recesses on the edge of the spool case, thereby causing the latter to revolve, and at the same time allowing sufficient room for the movements of the needle and its thread. In eonnection with the stationary spool case holder, there is a lever so disposed, that by the action of a cam on the driver on one arm of this lever, the other arm, which is hooked, catches the needle thread and holds the same, whilst the spool, by means of the nose upon it, enters and turns itself through the loop, the thread being released from the hook when the spool ease is in a proper position for the loop to escape. Fig. 171 represents a vertical section of a portion of the top of the driver looking towards the back of the machine, and showing the arrangement of hooked lever for retaining the loop; and fig. 172 is a plan of the top of the driver and spool case, with the nose of the latter about to catch the needle thread. E, is the driver arranged to run loose on the shaft, D. On the bottom of this driver, and forming part of the same, is a grooved pulley, driven by a band from the main shaft. A second pulley is fitted loosely on the shaft, D, for receiving the band when the machine is required to be stopped. *d*, is a cylindrical box forming the top of the driver, E, the interior of which is provided with a number of teeth, or projections, *e*. F, is the spool case holder, secured to the top of the shaft, D, the edges of the holder being bevelled to receive the similarly shaped edges of the spool case, G. It will be seen that the spool case holder, E, with its spool case, G, is placed eccentrically to the cylindrical portion, *d*, of the driver, E. The spool case has a series of curved recesses formed on its periphery corresponding to the teeth, or projections, *e*, on the driver, and is also provided with a nose, *g*, for catching the loop of the needle thread. Between the nose, *g*, and the point, *x*, on the spool case, the latter is recessed for the purpose explained hereafter. The spool rests with its upper flange in a recess on the top of the spool case, the detents, *r*, serving to prevent either from turning without the other. Below the under flange of the spool, there is a radial arm which has its friction adjusted to suit the required tension of the thread, which passes from the spool through a hole in the end of the curve. The spool case, G, is confined by a fixed plate with bevelled edges, so as to prevent it from rising, but at the same time admit of its revolving freely. On one side of the spool case holder is secured the piece, K, the top of which reaches to about the middle of the spool ease, and there projects outwards, the projecting part being divided by a slot for the purpose of admitting the needle. P (fig. 171). The front of the piece, K, and between it and the needle (when the latter is down) is the lever, L, working on a pin screwed into the piece, K. One arm, *l*, of this lever rests on the bottom of the cylindrical part, *d*, of the driver, when not raised therefrom by the incline, *n*, on the driver; the other arm, *m*, of the lever is hooked so as to catch the needle thread above the eye of the needle. A spring, *o*, serves to keep the arm, *l*, of the lever down when not acted upon by the incline, *n*. Motion is imparted to the middle lever by suitable connections with an eccentric or cam on the lower portion of the driver, E.

Fig. 171.

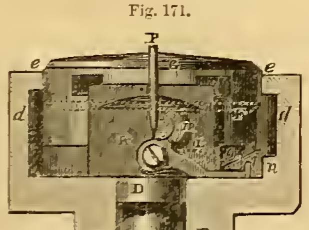
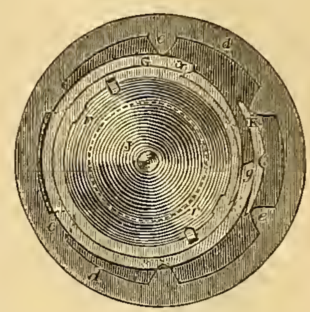


Fig. 172.

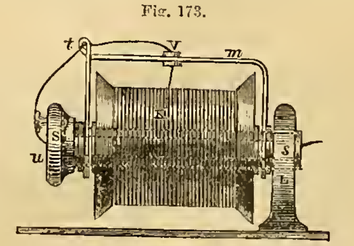


The *third* part of this invention consists in the use of an auxiliary lever, actuated by a peculiarly shaped cam on the driving shaft, for the purpose of taking up the excess of slack in the needle thread independently of the motion of the needle, by which addition the movement of the needle may be considerably reduced below that required in ordinary sewing machines, and, consequently, a greater working speed is attained.

The *fourth* part of the invention consists of a peculiar apparatus for cording the edges of fabrics, applicable to any ordinary sewing machine, whereby the cord is kept in its place within the hem of the fabric, whilst the latter is operated upon by the needle and thread. Provision is made, also, for ensuring the unimpeded action of the machine should knots occur in the cord, or irregularity in the edge of the fabric. An improved apparatus is also described for guiding and feeding bindings to be laid over and sewed on the edges of fabrics.

The invention consists, *fifthly*, of arrangements for working two or more vertical needles in the same machine and by one needle slide, so that at one feeding along of the article to be sewn, two or more rows of parallel stitching can be executed simultaneously. These arrangements are applicable to circular needle machines of the Grover and Baker make, as well as to shuttle and circular spool machines; each straight needle requiring, however, a separate circular needle to work in connection with it when machines of that class are employed. The *sixth* part of this invention consists of an improved feed apparatus, wherein the notched or roughened feed bar is kept constantly in a level position, and the feed mechanism is comprised in a much smaller space than usual, whereby it may be more readily applied to a cylindrical line or case used in sewing ~~tabular~~ articles. tube The last portion of the invention consists of an improved mode of applying tension or drag to the needle thread as it leaves the spool. Fig. 173 represents a side elevation of a spool fitted with this improved tension arrangement. The thread passes from the spool, K, through the guides, V, T, and U, and thence through the hollow spindles, S, in the centre of the spool, carried by the bracket, L, and through the guide in the needle bar or holder, and so down to the needle. The guide, V, is carried by a flyer, *m*, and traverses along a slot made therein, parallel to the axis of the spool The outer end of the hollow spindle has a screw thread formed

Fig. 173.



therein, on which is screwed a double nut, s, for the purpose of tightening or loosening the play of the flyer, which revolves round the spindle and spool as the thread is unwound.

Frederic Whitaker obtained a patent on the 20th of October, 1855, for an invention relating to the class or kind of sewing machines in which two threads are employed. According to this invention, the loop of the needle thread is caught by a hook which passes it round, and over a spherical thread holder. The delivery of the thread from the ball contained within the spherical thread holder is regulated by passing the thread through a small piece of vulcanised India-rubber. In lieu of the operation above described, the hook may be made to pass through the loop of the needle-thread and then seize the ball thread and draw it in the form of a loop through the loop of the needle thread, and afterwards pass it over the ball.

A patent was granted to Auguste Edouard Loradoux Bellford, on the 1st of November, 1855, for improvements communicated to him from abroad, consisting of a peculiar kind of looper, working in connection with a needle so as to produce a single thread stitch; also of a mode of operating the needle in connection with the looper so as to throw the thread over its point; also, of a peculiar feed motion. We find that this patent is a reapplication and completion of the provisional protection obtained by Mr. Bellford, on the 28th of May, in the same year, and already referred to by us in our twenty-first article.

Joshua Kidd, obtained provisional protection on the 12th of November, 1855, for certain improvements relating to sewing or stitching machinery, wherein two threads were used, one thread being carried by a stationary thread holder, and the other conducted round such holder by a needle having a vertical and inclined motion. The needle carrier in this machine is proposed to be jointed, by which arrangement the needle is caused to incline or oscillate during its withdrawal from the fabric and pass the thread round the stationary thread-holder, so as to lock the two threads together. Mr. Kidd also describes a peculiar arrangement of apparatus for feeding the cloth and giving motion to the needle carrier.

Jean Lobstein obtained a patent on the 24th of November, 1855, for a machine wherein a vertical needle and a shuttle are employed, in conjunction with peculiar arrangements of parts for holding, feeding, and guiding the fabric, so as to admit of articles being sewed whether flat or tubular, closed or not at one end, with the sewing in straight, zig zag, or curved lines. Means are also employed for actuating shuttles of various lengths in one machine; for regulating the tension of the thread, and for varying the length of the stitch.

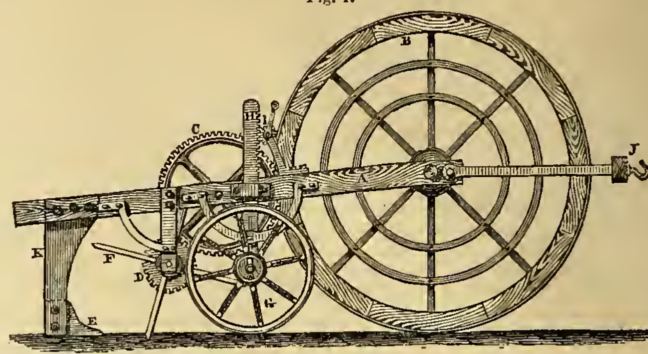
Bernard Hughes obtained a patent on the 11th of December, 1855, for so arranging and operating the needle shuttle and other parts of a sewing machine that the thread from the needle when passed through the material to be sewn, is tied by a half or whole knot of the shuttle thread. The feed motion is so worked that the thread may be tied at the will of the operator, by a half or whole knot, at every or any stitch that may be thought necessary. The needle, which has an eye near its point, works vertically, and the shuttle revolves in a circular shuttle box placed vertically and parallel to the needle's motion, but below the work plate which carries the fabric. A looper is used for bringing the needle thread across the track of the shuttle, and thereby form a loop through which the shuttle may pass. Should it be required to tie each stitch with a half knot only, the cloth is moved forward during the upward motion of the needle; and when it again descends, the looper makes another loop for the passage therethrough of the shuttle. If a double knot is to be tied, the cloth is only moved at each alternate ascending movement of the needle, which is thus caused to descend a second time with the same hole in the fabric, and the loop formed is the same as in the first descent, so that the shuttle is caused to pass twice through the same loop.

James Murdoch, obtained a patent for an invention which had been communicated to him, dated the 21st of December, 1855. According to this invention, five instruments are employed for producing chain-stitched embroidery. These instruments consist of—1st, a needle; 2d, a tightener, for imparting the proper tension to the thread; 3d, a hook to take hold of the loop formed in the needle thread; 4th, an opener or pusher, for extending or opening out the loop through which the needle has to pass; and 5th, a hook for fastening off the thread at the completion of each figure or design. As this machine is intended for the production of ornamental embroidery, and not as a sewing machine, it is not within our province, in the present paper, to enter into the details of its construction.

COMBINED PLOUGH AND ROTATORY CULTIVATOR.

The machine which we have engraved to illustrate the present article has been designed by Mr. Tennant Wormald of Northgate, Wakefield, for ploughing or cultivating land in a manner closely approximating "to spade labour." The machine, although more particularly adapted for light and sandy soils, may be found eminently useful on land of the ordinary quality. Fig. 1 of our illustrative engravings represents the machine in longitudinal elevation; fig. 2 is a plan corresponding; and fig. 3 an end view. The framing, A, is of a rectangular figure, and open at the front end, at which part is fitted the axle of the main driving wheel, B. This wheel is constructed with a broad, plain, bearing surface, carried upon an internal framework of

Fig. 1.



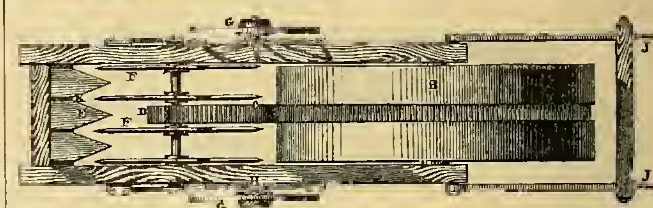
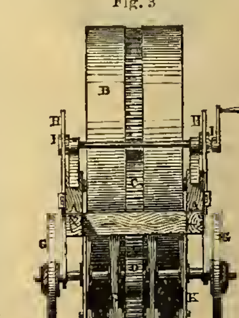


Fig. 2.

diverging arms, which are strengthened by concentric rings of metal. The periphery of the driving wheel is divided, as shown in the plan, the space between the plain parts forming a large spur wheel which is in gear with the wheel, C. This wheel gives motion to the wheel, D, the axle of which has fitted to it the coulters, F, these serve to cut up and loosen the ground in front of the ploughshares, E. At the backward end of the framing, and pendent therefrom, is fitted the vertical bracket pieces to which the ploughshares, E, are bolted. The ploughshares are formed with sharp pointed extremities, and rising up in an angular direction on one side so as to turn the earth over in their progress. The depth to which the ploughshares and coulters penetrate is regulated by the bearing wheels, G, which are carried on the adjustable vertical pieces, H. The bearing wheels are raised and lowered by means of the pinions, I, which gear with the racks on the bars, H, each pinion being put in motion by a winch handle. To the front ends of the framing, A, are jointed two parallel bars which extend out beyond the wheel, B, and are connected by a cross rail. The ends of the side bars are formed into hooks for attaching the harness of the horse thereto. As the machine is drawn along, the coulters divide the soil into slices, which are broken up and turned over by the shares, E, and the earth is thus effectually disintegrated and exposed to the beneficial influence of the air and action of the solar rays.

Fig. 3



GOODCHILD'S TROCHEIDOSCOPE.

This instrument, just introduced to the public, under the auspices of Messrs Horne & Thornthwaite, Newgate Street, London, supersedes the "colour-top," and promises to be as popular as the kaleidoscope or stereoscope. It is a mechanical contrivance for exhibiting various combinations of colour, and producing to the eye, tinted patterns, and otherwise giving results which become important to all interested in, or connected with, the manipulation of colours, and in the forming of designs for fabrics and decorations. It also constitutes an elegant and instructive optical recreation—as, while the eye is charmed with the appearances presented to it, valuable facts and curious phenomena are eliminated, interesting to the student of science, and affording, as it were, grammatical data for the arrangement of colours in true harmony or proper contrast.

The effects of the instrument are based upon a well-known law of vision—that of images being retained upon the retina after the object itself has been removed. Various toy instruments have been designed to illustrate this. There is the thaumatrope, which consists of a card having, say, a dog on one side, aud a moukey ou the other. The card is furnished with a striug at each side (forming an axis); upon holdiug these, and causing the card to revolve, the moukey will appear upon the dog's back—both sides of the card being apparently visible at the same time. The phantoscope is another, wherein, by looking through a slit in the back of a revolving disc, upon the face of which, figures, in various attitudes, are delineated, the appearance of them in a looking-glass opposite the slit, is such as to give them apparent motion, as dancing, playing at leap-frog, &c. These instruments show a definite figure or set of figures, and simply illustrate the phenomenon.

"Colour-tops" are modifications of the old humming-tops, in the form of a disc furnished with coloured sections, which, upon being rotated in the usual way, appear blended to the eye, and form an indefinable tint depending upon the colours on the disc under operation, and their proportions; the colours, in this instance, passing before the retina too rapidly to be retained. These toys have lately received some important improvements by Mr. Gorbam, who, by adding black perforated discs in a state of revolution, also succeeded iu restoring the colours to the eye through the perforations, and so produce very beautiful combinations and tinted patterns, &c.

We here append a few words upon the nature of light and colours to aid in the description of an instrument whose uses are dependeut upon their application and laws.

White light, as that from the sun, is composed of seven colours, or of the rays from which each and all of the seven colours can be produced; this is made perceptible to us by using the prism, aud also in the rainbow. The colours are violet, indigo, blue, green, yellow, orange, red. If these be arranged in sectors upon a disc, in the following order and proportions, and are made to revolve, the proof of the nature and composition of white light is at once established—

Violet,..........80 degrees.	Green,..........60 degrees.
Indigo,..........40 "	Yellow,..........48 "
Blue,..........60 "	Orange,..........27 "
	Red,..........45 "

as a white general tint will appear. If these proportions be altered, or one colour be omitted, a general tint will be produced on revolution, accidental or contrasting to the colours so omitted,

as if we omit Red, Green will appear.
" Blue, Orange Red "
" Yellow, Indigo "

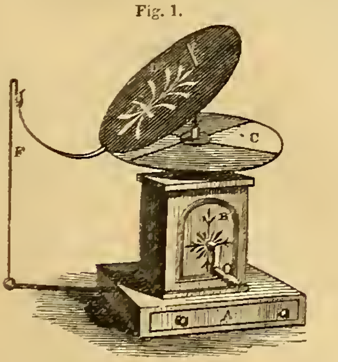
Thus it will be observed that a study of nature's own work in this case, gives us the rules and regulations which we see set at nought, whenever we find a disagreeable arrangement of colours which are uusatisfactory to the eye; because proper contrasts and natural harmonies have been utterly ignored. Greater attention has of late been paid to these important elements, and the eye is not now so frequeutly offended with the mixtures our painters and manufacturers were wont to press upon our visual attention; and these laws, by study, become as imperative as are those of the organs of smell, in reference to a fragrant perfume or uoxious effluvia.

The purpose of the trocheidoscope is to elucidate these laws, and to exhibit various phenomena which present themselves, and which can be made practically available in the tinting of designs for decorations, patterns for dresses, and the multifarious uses and purposes to which harmonious colouring is applicable.

No mechanical arrangement seems to have been made for the blending of colours upon a disc beyond the turbinal toys before mentioned.

To effect this there is employed a peculiar arrangement of multiplying wheels so that by gently turning the handle or key, the disc is made to revolve at considerable speed at the will of the operator. The advantages of this plan will be self-evident. The speed can be easily controlled and adjusted to the greatest nicety; effects can be shown at a slow speed impossible with the "colour-top." The speed can be varied, thus showing several effects with one disc, and the instrument being stationary, a proper light can be chosen by which to view the combinations, while the black patterns being fixed at an angle, allows a large play of light upon the colours, and greatly increases their brilliancy; and a large number of new experiments can be tried, and effects evolved hitherto unattainable.

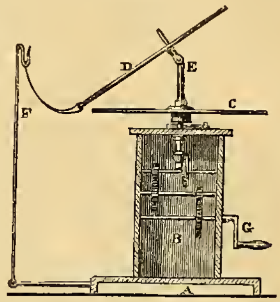
Fig. 1.



A, stand with drawer. B, chamber of motion-work. C, coloured discs. D, pattern disc. E, spiudle. F, hook arm, for holding pattern strings. G, handle.

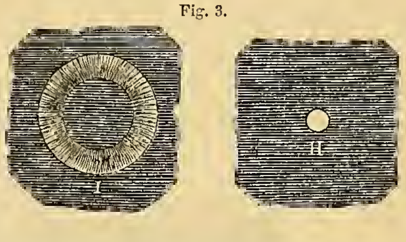
We before mentioned that the pattern discs in the "tops" revolved with the colours, but this is dispensed with by adopting a peculiar arrangement of the spindle, and so are able to represent natural objects, as birds, butterflies, flowers, &c., as well as geometrical designs; aud the trocheidoscope has the effect of *tinting* these, without their losing their original form by multiplication, thus rendering it of importauce to pattern designers, decorators, and other artistic colourists. The peculiarity above mentioned is a kind of eccentric motion, gained by deflecting the head of the spiudle to the extent required by means of a joint; the design discs, D, are hung upon this deflected head, and, when the machine is put in action a motion is imparted to it just sufficient to tinge the desigu with the most elaborate colourings. One singularity is, that the tints always remain in the same position, in a certain perforation, when they have once assumed it. Fig. 2 shows a section of the box, B, and the wheel-work for driving the spindle, E, and disc, C.

Fig. 2.



A curious effect of circular perforations is, that they become rings with black centres, and show the colours of the disc below, ranged in regular order round every one of them; thus, H (fig. 3), assumes the appearance of that at I, as, suppose a disc of four colours beneath, we shall, on rotation, have them as shown in the radially shaded parts of I. If these holes be placed near enough together, they will form a coloured interlinked chain wheu rotated, aud assume an appearance of rotundity, having a very curious effect.

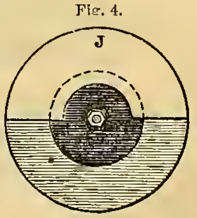
Fig. 3.



The manipulation is exceedingly simple, say, for showing a pattern; screw ou the coloured disc you may select, then hang the black pattern on the upper portion of the spindle, looping the string on to the hook, so that it may be prevented from revolving, and yet hang loosely without the string or the black pattern touching the coloured disc, then rotate. The pattern will be fully tinted.

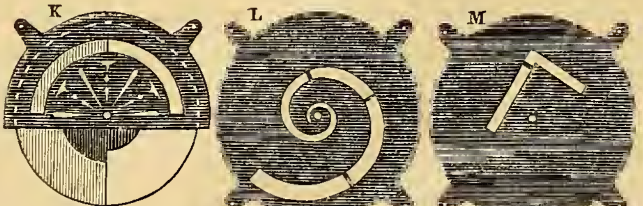
An important class of experiments, shown by this instrument very clearly, is the evolution of the contrasting colours from their originals; thus, red produces bluish green, blue produces orange red. To effect this, screw on a disc, say, half red, half white, and with it a black shader, as shown at J (fig. 4), having the black over the red as shown in the diagram. Ou rotation, the outer ring of black will have become bluish green; again, yellow and white, will produce a dark violet, all educing the same colours as those given by *Buffon* in his wafer experiments, thus clearly demonstrating the value of the instrument as an educational medium, and its truthful exposition of a natural law.

Fig. 4.



The effect of black in partially shading sectors of colours, is shown in many apparently extraordinary changes of tint, and which upon the trocheidoscope may be made a very instructive and, at the same time, entertaining series of experiments. These protean effects are produced with black discs,

Fig. 5.



having some simply shaped figures and incisions, as shown at K, L, M (fig. 5). These, upon being put over the short spindle upon a coloured disc, will, upon rotation, show certain colours through the perforations;

then, upon just touching the projecting spokes with the finger or a light wand, the colours will be changed and the effect given is very pretty, and apparently wonderful. These experiments are very suggestive for the arrangement of tints, stripes, and fabric designs, and afford many hints which may be found of great use in those matters. A change of 1-20th part of an inch will give a new set of shades, which can be maintained for any length of time, and registered for execution, or, indeed, copied at once. The rationale of this effect is, that by touching the spokes, the black shader is retarded momentarily, and so the colours beneath are shifted; but, by the interposition of black, they are preserved and enriched, and not lost and blended as if the black were not there. From this outline it will be perceived that the instrument possesses great capabilities for evolving various original and beautiful effects of combinations of colours; and which, in the hands of the ingenious, may be multiplied to an almost unlimited extent.

NET-MAKING MACHINERY.

The making of an open meshed fabric, suitable for fishing nets, by hand, is an operation simple enough, but to accomplish the same end by the aid of machinery is a widely different matter; so much so that very few inventors have turned their attention to this branch of manufacture, From 1617 down to 1851, only seven English patents were taken out for this subject, and since then to the present time there have been only some four or five. Not that the rapid manufacture of fishing nets has been thought unworthy of attention; for, in 1802, the French Government offered a prize 10,000 francs for an automatic net-making machine, and this sum was ultimately granted to M. Buron, but the machine was not brought into use. The invention, to which we now direct attention, is the result of the most recent improvements introduced by Messrs. J. and W. Stuart, the eminent fishing-net manufacturers, of Musselburgh, and it comprehends the very latest improvements in this branch of refined mechanical skill, particularly as regards the manufacture of the small meshed nets used in the pilchard fishery.

Fig. 1 of the illustrative engravings is a front elevation of a net-making machine, having the patentees' improvements applied thereto. Fig. 2 is a vertical section of the machine Fig. 3 is a front view of the guide or "fair leader," by means of which the hooks are guided in the pro- hooks, E, which extend in a row across the machine. The hook is formed of brass, its extremity being bent outwards in a lateral direction. The hooks are fixed into leaden shanks, which are made with dovetailed indentations to admit of their being readily attached to the bar, F, the shanks of the series of hooks being firmly held by a secondary bar, which is bolted to the lower one. The hook bar, F, is made with two outwardly projecting eyes, by means of which it is connected to the horizontal shaft, G, the journals of which are carried in the rocking frame, H. The centres on which this frame moves are a pair of screws that pass through the snugs, I, which are bolted to the front part of the frame, B. The hook bar is moved to and fro in the required direction by means of the hand lever, J, which is furnished with a cross handle at its outer extremity. The hand lever, J, has fitted to it a laterally projecting screw, K, the end of which projects out on the other side of the bar, the extent of the projection being regulated by a nut; the projecting part is filed smooth and flat on one side; it forms a stud or pin, which enters and travels in the curved groove or recess made in the guide, L. This guide, which is technically designated the "fair leader," consists of an elliptically shaped plate of iron, fig. 3, supported at right angles to the front of the machine by being bolted to an outwardly projecting bracket that is secured to the front part of the frame, B. It is by the traverse of the pin, K, in this circuitous path which causes the hooks, E, to place the loops of the net in the proper positions for forming the knots. To the face of the guide, L, is fixed a stud, on which is hung the pawl, N, which is prevented from moving too far back by a stop fixed behind it; a second pawl, O, is fitted just below the centre of the groove; this pawl may be arranged on either side of the curved recess in the plate. The meshes of the net are formed by knotting to the loops of the last row of meshes the yarn which is to form the next row; this is effected by a series of operations, the most important of which is the guiding of the yarn in a particular manner about a series of duplex hooks, technically termed "needles." Each needle, as constructed according to these improvements, consists of a brass hook, P, the extremity of which is downwardly directed, and extends outwards in an angular direction; the outer part of the hook is bent in a lateral direction towards the right. Arranged parallel with the hook is a second hooked part, the outer extremity of which is downwardly directed and formed of a triangular figure, the front or nose part of the hook forming a vertical or nearly vertical line. This modification is important, as it admits of much smaller meshes

Fig. 1.

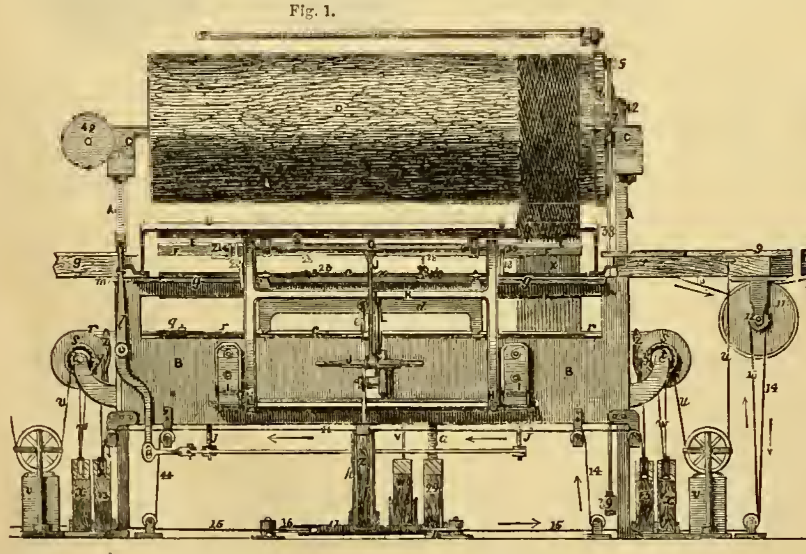
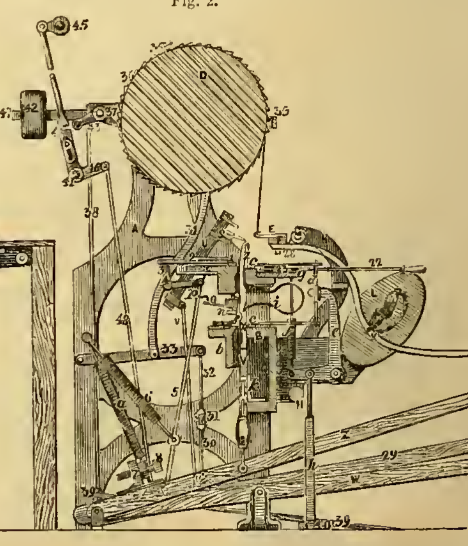
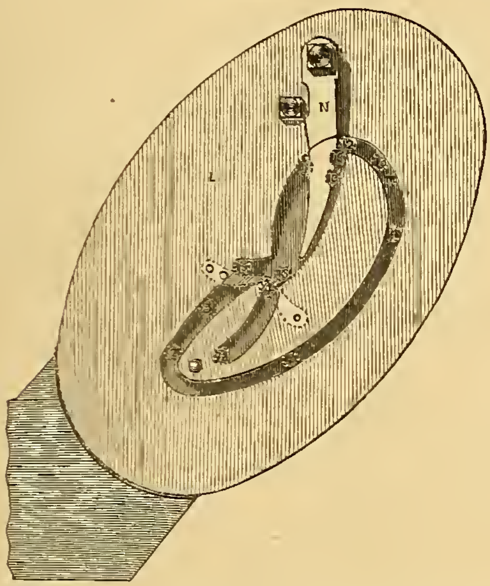


Fig. 2.



per positions for forming the knots in the net. Figs. 4 to 8 are different views of the needles, hooks, and the upper part of a faller, which will be referred to in detail in describing these portions of the mechanism. The framing of the machine consists of the open standards, A, which are connected by the transverse frame, B, to the front part of which some of the principal actuating portions of the mechanism are attached. At the upper part of the standards, A, are two laterally projecting ledges, to which are bolted the boxes, C, in each of these are fitted a pair of antifriction rollers; upon these rollers the spindle of the beam or wooden cylinder, D, on which the net as it is manufactured, is wound. This cylinder has a longitudinal notch or recess cut in its periphery, in which is inserted a series of pins corresponding in number to the meshes in the width of the net to be made. At the commencement of the operations with the machine a piece of net is hung upon the pins in the beam, D, the loops at the lower part of the piece being each caught in one of a series of being made with this kind of needle than heretofore, on account of this part occupying less space. The metal at the upper part of the triangle is bent over to the side and curved downwards to form a concavity; this part of the needle forms a horizontal groove for the passage of the shuttle, when a series is arranged together. The overlapping part of the metal is also formed into a smooth segmental groove immediately beneath the upper groove, and the outer part of the needle diverges a little to the left. These duplex needles have the leaden shanks, R, cast thereon, which have dovetailed indentations, so that they fit the needle bar, S; this bar is arranged in an angular position, and is carried upon brackets, which are bolted to the transverse cast-iron bar, T, which forms a part of the framing of the machine. The needles are arranged side by side on the needle bar, and are bolted down by a secondary bar, similar to the arrangement of the hooks, E. Behind the needle bar, and extending above it, is a rectangular frame, U, termed the "relieving bar," its office being to bring the meshes into and move them off the "wickers" of the needles; this is effected by the projecting part on the front of the bar. The frame, U, is centred upon two screws, the ends of which enter conical holes made in two pendent brackets, which are bolted to the standards, A. The lower part of the frame or relieving bar, U, is connected by means of the rod, V, to the treadle, W. Immediately below the needles is arranged a series of thin steel bars, X, which are termed "fallers," the upper extremity of each of these fallers is formed into a hook, as shown in fig. 2, and in the enlarged view, fig. 7.

Fig. 3.



When the fallers are raised, the terminal hooks rise between the duplex extremities of the needles; the lower ends of the fallers, when in their lowest position, rest upon the transverse bar, Y, by means of which they are raised. The bar, Y, is connected by levers and adjustable links to the treadle, Z, which is kept in an elevated position, when not otherwise acted upon, by the helical spring, A. The depression of the treadle, Z, raises the fallers, X, to the level of the bar, *b*, and they are pushed back so as to rest thereon, by means of a duplex buffer, arranged at the front part of the machine. This movement consists of two flat bars, *c*, which rest on the frame, B; these bars are connected to the vertical duplex cross head, *d*, and this part is bolted to the bell-crank lever, *e*, the fulcrum of which is a stud projecting from the bracket carrying the "fair leader," L. The extremity of the short arm of the bell-crank lever, *e*, is attached to a helical spring, *f*, which is fast to the under side of the board, *g*. The bell-crank lever has jointed to it the upper extremity of the bridle, *h*, between the open part of which the treadle, Z, moves freely. When the fallers are raised up to the bar, *b*, the treadle then slightly depresses the bridle, *h*, which causes the buffing bars, *c*, to be moved backwards, and in this manner press the fallers back, so that they rest on the bar, *b*. A downward pressure is exerted on each faller by means of a thin curved blade-spring, *i*, which is fitted in front of the faller; one extremity of the spring being secured to a bar of iron, fastened to the

Fig. 4.

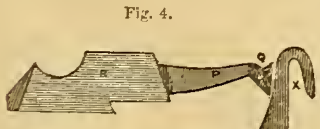


Fig. 6.

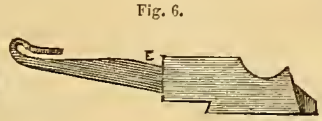


Fig. 5.

Fig. 7.

under side of the frame, B, the free end resting in a notch cut for the purpose in the front edge of the faller. The pressure of these springs keeps the whole series of fallers resting firmly on the supporting bars, and when the fallers are moved off from the bar, *b*, the action of the springs causes the fallers to descend smartly, and nearly simultaneously, on to the faller bar, Y. Connected with the faller bar, Y, is a movement for adjusting with great nicety the height of the faller bar, so that it may be regulated with the utmost exactness to suit the different sizes of yarn or twine used in the net manufacture. The arrangement of this movement is shown in fig. 1; it consists of two screws, *j*, which work out through eyes cast on the outer faces of the brackets, *k*, each eye having an internal screw made therein, which corresponds to the screws, *j*. The lower ends of the screws, *j*, are squared, and to these ends are fitted two horizontal levers, which project forward towards the front part of the machine; the levers are connected to each other by the rod, *k*, which is jointed by a link to the curved hand-lever, *l*. This lever is centred upon a stud which is fixed in the face of the framing, B, the handle of the lever being brought within convenient reach of the operator; and projecting out from the back part of the flattened portion of the lever is a pin or flat blade, which falls into the notches of a segmental index-plate, *m*. This plate is fixed to the front of the frame, B, and by moving the handle more or less to the right or left, the screws, *j*, are slightly raised or depressed. The upper extremities of these screws being fixed in the faller bar, Y, it follows that a corresponding amount of traverse in a vertical direction is thereby imparted to it. The several notches in the index-plate, *m*, may be marked in such manner as to enable the operator to readily adjust the faller bar to the thickness of yarn about to be used. During the time that the fallers are held in a stationary position, they are retained by the keeper, *n*, which is a thin plate of metal attached to a rocking shaft, carried in snugs pendent from the bar, T. On the face of the keeper, *n*, there is a small projecting part which falls into the notches or recessed parts cut in the backs of the fallers, X. At the back part of the rocking shaft a laterally projecting bracket, *o*, is fitted thereto; the lower extremity of a curved-blade spring, *p*, presses on the face of this bracket, and causes the keeper to come in contact with the fallers, and so lock them during the time the beam is operated on by the keeper treadle and the knots of the net are being drawn tight. When the fallers have performed their part in the formation of the knots, they are then required to be moved quickly out of the way, this is done by causing them to descend in rapid succession on to the faller bar, Y. The pushing off of the fallers from the bar, *b*, is effected almost simultaneously by means of a "slur" or traversing apparatus, which moves with great rapidity from side to side of the machine. The slur, *q*, is a small wheeled apparatus which traverses to and fro in a groove, formed by attaching a strip of metal to the surface of the bar, *b*; the front part of the slur is made with an outwardly projecting finger. As the slur traverses along behind the fallers, the finger comes in contact with them, and so pushes them off the bar, *b*. The slur has attached to each end of it a cord, *r*, which is wound on to the contiguous pulley, *s*; the spindles of these pulleys are carried in brackets, projecting laterally from the end standards. On the spindle of each pulley, *s*, is a barrel, *t*, to which is attached the end of the cord, *u*; this cord passes under the pulley of the weight, *v*, the other extremity of the cord being carried upwards, and fastened to the exterior of the shuttle-race, or as it is technically termed, the "shuttle-rod." A second cord, *w*, is attached to the barrel, *t*, and several turns are wound on the barrel in a direction contrary to that which causes the cord, *u*, to be wound on the barrel; the extremity of this cord, after being passed under the pulley in the treadle, *x*, is secured to the bracket on the face of the standard; the arrangement is precisely similar on both sides of the machine. When the treadle, *x*, is depressed by the foot of the operator, the cord, *w*, is unwound from the barrel, and the cord, *u*, wound thereon, at the same time raising the weight, *v*. As the treadle comes near the floor it depresses the T shaped end of a rod pendent from the end of a bell-crank, *y*, the upper part of which is shown in fig. 1. The bell crank lever is centred on a stud projecting from the face of the end standard, and the lever moves in a plane parallel thereto. The motion of the bell-crank lever about its centre causes its upper extremity to move the barrel, *t*, along the spindle, so that a projecting nib or catch on the periphery of the barrel is brought into contact with the teeth of the annular ratchet wheel on the pulley, *s*, at the same time the stop, *z*, is brought opposite to the extremity of the bar, *b*, which prevents the slur traversing too far. The operator, simultaneously with the depression of the treadle, liberates, by a jerk on a slack cord, a catch at the opposite end of the slur traverse, which releases the slur, the descent of the weight causing it to be drawn rapidly along the traverse, the finger or projecting stud of the slur pushing off in its course the fallers, X. The parts are now restored to their normal position, and the slur is held by the spring catch prior to the traverse being effected to the opposite side of of the machine, the passage of the slur thus takes place from side to side of the machine, in manner similar to the action of a shuttle in weaving. A secondary buffing bar, for pushing the fallers forward, is fitted at the back of them; this bar, 1, slides backwards and forwards on the bar, T; it is connected by the links, 2, to the bell-crank levers, 3. These levers are centred on the horizontal shaft, 4, and their free extremities are connected by a rod, to which is attached the pendent link, 5. This link extends downwards between a slot made in the treadle, Z; it has, at the lower part, a projecting nib or catch; the link is held or retained in an angular position by the helical spring, 6, the upper ex-

Fig. 8.

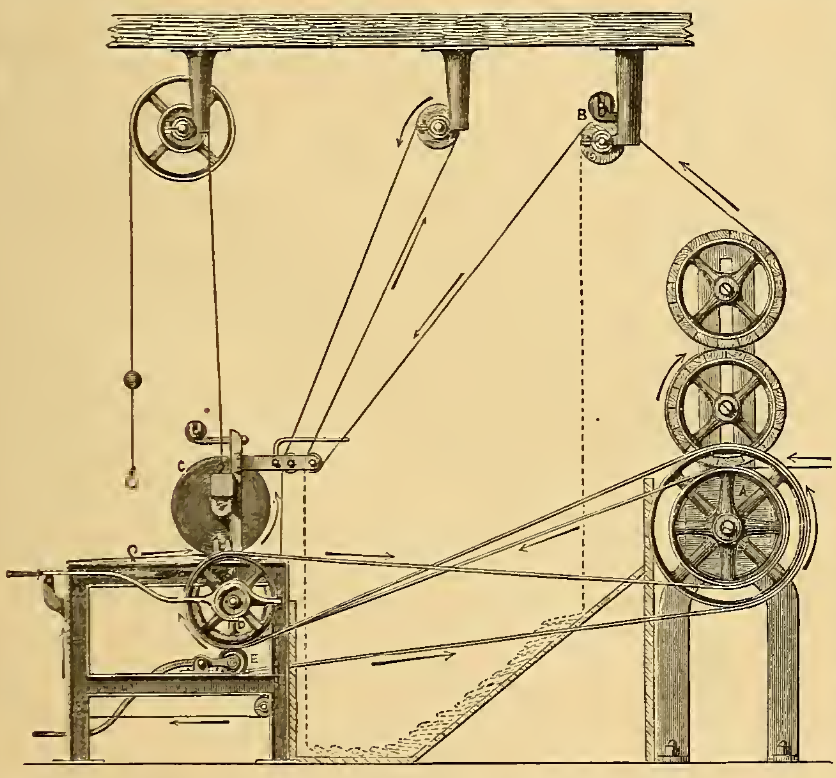
tremity of which is fast to a stud fixed in the end standard. The link, 5, is depressed by the lower part or base plate of the snug, 7, which is bolted to the treadle, and projects over the slot, and when the treadle is depressed this projecting part comes on the nib of the link, and draws it down. This motion of the link causes the bell-crank levers, 3, to turn upon their centres and move the bar, 1, inwards, which pushes the fallers forward, so that the long notch made in the front edge of each is close up to the bar of the frame, B. The fallers are now sufficiently forward that they may be raised up clear of the needles, and in readiness to be moved backwards between their projecting hooks. The further depression of the treadle brings the stud, 8, which is carried in the snug, 7, in contact with the link, 5, which knocks away the nib, and the link is instantly drawn back, restoring the bar, 1, to its normal position. Both of these movements for actuating the bar, 1, follow each other instantaneously, and the operation of moving the bar in both directions is effected during the descent of the treadle, so that by the time the treadle touches the bridle, *h*, the fallers are ready for being pushed back between the needles. The net is formed by the interlacing or knotting of a length of yarn to the previously formed row of loops, the yarns being carried through these loops, by means of shuttles or wires, which are projected, and caused to traverse from each side of the machine alternately. The shuttle-rods, 9, in which the shuttles traverse, project outwards in a lateral direction from the end standards, A, to which they are attached by brackets, and are supported at the outer ends by vertical wooden struts. A pulley is fitted at the extremities of each shuttle-rod, and round these pulleys the cord, 10, is carried; one end of this cord is fastened to the rim of the pulley, 11, and the other end is secured to the pulley after passing several turns round it, so as to have a sufficient amount wound on it to admit of its extending across the machine when unwound. The pulley, 11, is hung in a pendent bracket, which is bolted to the under side of the shuttle-rod; the pulley is of the compound kind, having a pulley, 12, of much smaller diameter cast in one with it. The shuttles are simply lengths of wire having a hook to receive the twine at their forward extremities; they are made long enough to extend wholly across the width of the net, and they are fastened by twine to the cord, 10, as shown in the sectional part of the shuttle rod, to the right of fig. 1. These shuttles pass through nozzles or guides, fixed to the inner ends of the shuttle-rods, and they are caused to traverse across the machine by giving motion to the cords, 10; the arrangement on each side of the machine being similar. Supposing that it is required to cause the right hand shuttle to traverse across the machine, the treadle, 13, on the left hand side, is depressed by the operator, this action draws the cord, 14, downwards, and causes it to pass over its respective guide pulleys in the direction of the arrows. The depression of the treadle, 13, thus unwinds a corresponding length of cord from the pulley, 12; the rotatory movement of the pulley winding the cord, 15, on to its periphery, this cord being fastened to the pulley to wind on in the opposite direction. The extremity of the cord, 15, is connected to the free end of a lever, 16, which is centred on a stud fixed to the flooring. There is a corresponding lever, 16, to actuate the cord, 15, on the left hand side of the machine. The two levers, 16, are connected to each other by means of the helical spring, 17, which retains the levers in the angular position, shown in figs. 1 and 2, when the spring is not otherwise acted upon. The turning of the pulley, 12, also puts the pulley, 11, in motion, which thus draws the cord, 10, from the inner end of the shuttle race, 9, at the same time, a corresponding amount of cord is unwound from the pulley, and passes round the pulley at the outer end of the shuttle-rod. The motion of the cord, in the forward direction, carries the shuttle over the needles, passing in its passage through the previously prepared loops of the net. When the shuttle emerges from the opposite end of the loops, the attendant hooks the end of the yarn, of which the net is made, into the hook on the extremity of the shuttle, and the pressure on the treadle, 13, being removed, the shuttle is drawn back through the loops, carrying with it the yarn. The drawing back of the shuttle is effected by the spring, 17, the depression of the treadle, 13, and the consequent winding up of the cord, 15, having previously drawn the lever attached thereto outwards, and so distended the spring. When the treadle is released the reaction of the spring draws the cord, 15, off the pulley, 12, thus causing the pulley, 11, to rewind the outward portion of the cord, 10, on its periphery, and draw back the shuttle. At the next operation of this kind, the shuttle on the left hand side of the machine is operated, and the insertion of the shuttle is effected by means of the right hand treadle, 13. The yarn for the supply of the shuttles is wound on bobbins which are affixed to the front of the shuttle rods, so as to be within convenient reach of the operator. In the process of making nets with this machine, the hook bar, F, carrying the hooks, E, has to be moved to the right or left at every alteration, so as to cause the hooks to enter the fallers; one faller to the right or left, according to the position it was in at the formation of the previous half mesh. This operation is effected by means of the mechanical arrangement, shown in figs. 1 and 2 of the accompanying engravings. At the right hand side of the frame, H, a curved blade spring, 18, is fixed to the upper part of the frame; the pressure of the spring against the projecting stop, 19, which is bolted to the hook bar, F, has a tendency to keep the bar towards the right. On the opposite or left hand side of the frame, H, is fixed a spring, 20, against which the end of a screw, 21, presses; this screw is carried in a stud or angle piece of iron, bolted to the hook bar, F; by turning this screw the hook bar is accurately adjusted to bring the hooks properly between the needles, when the hook bar is moved forward. The arrangement for retaining the hook bar to the right or left, is attached to the board, *g*, and consists of a T shaped hand lever, 22, the handle part of which extends outwards in front of the machine—this lever is centred on a stud fixed in the board, *g*. The laterally projecting extremities of the lever, 22, are curved outwards, and when the handle of the lever is pushed to the right or left, one of the hooked extremities passes behind one of the catches, 23, which forms a vertical projection on the face of one of the horizontal pawls, 24. These pawls are centred on studs fixed to the outwardly projecting base plates, 25, which are fastened to the board, *g*, the pawls are each passed outwards in a lateral direction, by the springs, 26, the inner ends of which are secured by pins to the base plates, 25. Outside each pawl is fitted an adjusting screw, 27, to regulate the backward traverse of the pawls. When the hook bar, F, is lowered by means of the lever, J, to take the net off the fallers, the pendent catches, 28, come between the catches, 23, and by moving the hand lever, 22, either to the right or left, the contiguous catch, 23, presses against the pendent catch, 28, and so moves the hook bar in either direction as required. When the yarn has been passed through the loops of the net, and the knots are properly formed, they are drawn tight by depressing the treadle, 29, which is connected by a link, 30, to a lever, 31, extending across the machine, and centred on a stud in the end standard. The lever, 31, is connected by a link, 32, to the lever, 33; this lever has attached to it the rod, 34, the upper end of which has a slot in it, that serves, by means of a stud, to connect the rod to the frame, 35. This frame has three diverging arms, the extremities of which extend over the teeth of the ratchet wheel, 36; the frame has also the outwardly extending arm, 37, which connects the frame by means of the rod, 38, to the wooden spring, 39. One end of this spring is screwed down to the floor, and near its centre a prop, 40, is interposed. The frame, 35, has also bolted to it the horizontal arm, 41, to which the counterweight, 42, is attached by means of a pinching screw. The arm, 37, carries a stud, on which is centered a bell-crank lever, 43, which swings on the stud, one arm forming a pawl to actuate the ratchet wheel, 36. The other arm of the lever, 43, has a laterally projecting stud, which is caught by the curved recess or catch made in the rod, 44, to which a reciprocatory movement is communicated from the crank, 45. The lower end of the rod, 44, is slotted and connected to the bell crank lever, 46, which is carried on a transverse shaft, 47; the other arm of the lever being connected to the treadle, 29, by the link, 48. The ratchet wheel, 36, is fast to the shaft of the drum, D, and it is made with an annular ring of teeth, the wheel is prevented from turning towards the front of the machine by a pawl, which is carried on a stud on the inner face of the frame, 35. When the treadle, 29, is depressed, the rod, 44, catches on the stud of the lever, 43, which takes into the teeth of the ratchet wheel, 35; the rotation of the crank, 45, causing the lever, 43, to force round the drum sufficiently to draw the knots tight—the downward movement of the treadle serving also to press the keeper, *n*, into the notches in the fallers, Y. The depression of the treadle, 29, also draws down the rod, 33, and with it the frame, 35, thereby raising the weight, 42, so as to keep the net tightly strained on the drum. As the meshes are formed, the net is wound upon the drum, D; the pawl which is carried on the frame, 35, does not interfere with the motion of the drum when winding on, or moving in a backward direction, its longer end counterbalances the shorter end, and causes it to be kept continuously in contact with the annular ratchet teeth, and so prevent any movement in a contrary direction. An indicator, 49, is attached to the machine at the left hand side, the mechanism of which is actuated by the rotatory movement of the drum, D, so as to show at a glance the number of yards of net on the drum, as well as the rate of manufacture.

In manufacturing nets with this machine, supposing the moving parts of the machine to be in the position indicated in fig. 2, on the accompanying engravings, the hooks are first passed through the needles by raising the handle into the first catch in the fixed pawl of the grooved guide or "fair leader," L. The relieving bar is then brought forward by means of the treadle, W, being depressed, the action of the relieving bar serves to bring forward one of the legs of the mesh into the "wickers" of the needles. The lever, J, is then depressed, so as to bring the end of the screw, K, to the bottom of the fixed pawl in the "fair leader." The fallers are then raised up to the slur bar, which is done by depressing the faller bar treadle, and while so doing, the buffing bar is brought into operation for the purpose of pressing the fallers back on to the slur bar. The next operation is to pass the shuttles through the cavity formed by the joint action of the hooks, needles, and fallers, so as to draw the yarn back through the cavity, the mesh being formed by the descent of the fallers as they are caused to drop in succession by the traverse of the slur. The lever, J, is then raised, which brings the hooks below the faller heads, the relieving bar is again brought forward, so as to disengage the net from the hooks. The keeper treadle is now depressed to the floor, which raises the fallers to clear the net from the groove in the needles, at the same time the keeper comes in contact with the fallers, and locks them, whilst the beam is drawing the knots tight. The lever, J, is then raised and depressed, so as to bring the hooks into a position to disconnect the net from the fallers, which being done, the row is completed.

This machinery has now been, for some time, in most successful operation at Messrs. Stuart's net works, in Musselburgh.

BEAMING MACHINE WITH DIFFERENTIAL SPEED.

An improved arrangement of the beaming machine, by which it is adapted to work at differential speeds, and in connection with machines to which a continuous rotatory motion is given, has been designed by Mr. John M'Gibbon, of Springfield, near Glasgow, and carried out at the extensive works of Messrs. Todd and Higginbotham. The accompanying engraving represents a partially sectional elevation of the machine. The beaming machine is shown working in connection with a siugeing machine, running at a very high velocity; the cloth passes from this machine between the rollers, A. There are three of these rollers arranged vertically. The lower one drives the pulley, D, by means of a crossed belt. This pulley is carried upon the horizontal shaft of



the beaming drum. The pulley, D, is put into or out of gear with the shaft, by means of a coupling actuated by a hand lever, which is brought within convenient proximity to the beamer's hand. There is a second and larger pulley on the spindle of the roller, A, the belt of which drives the small roller, E, which also gives motion to the drum on the shaft of the pulley, D. The roller, E, in its normal position is not in contact with the drum above it, but is brougbt into contact therewith when the foot lever is depressed. The differential speed of the machine is obtained in this manner, the ordinary speed is that given by the pulley, D, to the drum on its shaft, and the increased velocity is obtained by bringing the roller, E, in contact with the drum, the pulley, D, being previously thrown out of gear. The cloth is carried round and between the two upper rollers, A, thence between the rollers, B, and following the course indicated by the arrows, to the beaming spindle. The spindle is arranged to allow for the varying diameter as the cloth, C, is wound upon it. The empty spindle is laid in the bearings in the side framing, and resting upon each journal is a weight which moves up and down a vertical guide. The cloth, as it is delivered from the nipping rollers, B, of the singeing machine, is carried round and laid over the drum of the beaming machine, is brought round the empty spindle, and the winding or beaming goes on. As the diameter of the beam increases, the weights, which rest on the ends of the spindle, are lifted up the guides. These weights are connected to a cord which is carried upwards and attached to a double pulley overhead; the larger pulley has fast to it a cord which is brought dowu within reach of the operator's hand. When the beam is full the operator stops the machine by means of the hand lever, he then raises the weights, and the beam rolls out, being one inch off the vertical line of the centre of the drum. An empty spindle is now put in, and the cloth, which has meanwhile accumulated on the inclined surface between the rollers, A, and the beaming apparatus, is beamed by doubling the velocity of the speed. This is done by depressing the foot lever so as to bring the roller, E, in contact with the drum, and so drive the beam at double the speed; as soon as the slack is taken up, the pulley, D, is put in gear with the drum, and the beaming proceeds at the ordinary rate. The operation of shifting a beam occupies only from 10 to 12 seconds, so that the machine is capable of doing a very large amount of work during the day.

THE ROYAL INSTITUTION.

On the 15th ult., Professor F. Crace Calvert, lectured here on the influence of science on the art of calico printing. He commenced by showing the importance of the art in modern times. The art itself depended on the progress made in mechanical invention, in design, and in chemistry. The recent rapid progress in these three branches of knowledge was alluded to cursorily. The first great improvement in the mechanical part took place in 1815, previous to which the printing was accomplished by blocks of wood, upon which the pattern was in every block drawn by hand. Cylinders of copper were then first applied, the pattern of which was produced by pressure from a small hardened steel cylinder, carefully engraved by hand; several of such last-mentioned cylinders being successively employed to produce larger copper cylinders with the same pattern. Etching was then introduced, and afterwards a combination of both the die and etching. Mr. Lockhead, of Manchester, was referred to as one of the best producers at the present day of the printing rollers. An eccentric machine was subsequently applied, which, by means of a diamond point etched out the pattern in waves, and some very beautiful specimens of this were exhibited. Chemistry had also been called in to assist even mechanically, but electro-magnetism had done much more. A zinc roller was placed at a certain distance from the copper cylinder, and while both revolved at the same speed, a needle was applied to the surface of the former, and etched it or not as the surface of the other was magnetised or not. By a contrivance on this principle, twelve or fourteen diamonds were enabled to be worked at the same time. By all these means, and by a combination of the cylinders, 16 or 18 colours were now finished at once—the process being explained by diagrams. Mr. James Black, of Glasgow, was one of the present most distinguished printers, and specimens of his remarkable productions were exhibited. The professor stated that he had ascertained that, in 1858, no less than 750 millions of yards of cotton had been printed in Great Britain for exportation only, without taking into account the immense quantity that must have been produced in that year for home consumption. The more immediate object of his discourse was to show what analytic chemistry had done in favour of the art. The bleaching powder was the most important ingredient. The old method of bleaching by exposure to the atmosphere used to occupy six weeks—the work can now be better done in 12 hours. The powder was discovered by Scheele in 1770, and Berthollet first applied it to bleaching calico; and 30 years afterwards, an Englishman applied it to purely economical purposes. The calico is bleached before being dyed or printed in colours. Cotton, except as to indigo, requires mordants to fix the colour. In this respect it differs from silk and wool. George Wood, in 1820, discovered the means of fixing a great number of colours over the cylinders, and which were called steam colours; and a gentleman of Glasgow improved the process. After referring to different methods of obtaining beautiful colours, the lecturer alluded to the discovery in 1855, of a beautiful red colour applicable to woollens, produced from guano. Dr. Hoffman has also lately directed his attention to a series of investigations into tar products as producers of colour; and Mr. Perkins, one of the doctor's pupils, had very recently discovered a very beautiful purple, but which discovery had still more recently been eclipsed by one made by Mr. Price, a young London chemist, by which he obtained from such products a beautiful purple, pink, or blue colour, at will. The lecturer concluded, by stating, that we had thus been able to obtain from the mere cast-away refuse of our gas-works, those materials which might readily supersede in this art the indigo obtained from India, the lichens and guano from South America and Africa, and the madder from other parts of the world.

Dr. W. B. Carpenter, on the 24th of February, delivered his long anticipated discourse on the relation between the vital and the physical forces. After referring to the advantages of hypotheses in science as bringing all the facts together, however erroneous hypotheses may be, and adverting to the admitted fact that, truth springs rather out of error than out of chaos, he concluded it better to have wrong ideas than no ideas at all on any subject. On that before him he might be wrong, but he had a personal conviction of being right. He wished to show that the correlation, or mutual relation, supposed to exist between the physical forces, exists also with regard to things possessing life. The facts on which the former idea rests are well known and acknowledged. Thus the correlation of mechanical motion and heat is an established fact, without any theory. So, again, is that between electricity and magnetism. Now, with regard to the latter, an analogy offers itself in relation to life. The magnet must be made to *move* before the electricity can be shown to be induced; thus showing the necessity of a dynamic force being superadded to a simple static force. One condition of a living being is that there shall have been an original germ of it, on the form of which would seem to depend the form of the perfect being. The germs of animals and plants are not distinguishable. To make inquiries as to the simplest. What are the agents conceived in the production of a plant? They are (1), the materials of which it is built up; and (2), the conditions under which those materials can produce organisms. Here the great difference between dead and living matter presents itself. For the living, the tendency is to differentiation by variance of parts—as body and limbs, or muscle and skin; while, in dead nature, the tendency is to limitation, or a growing together homogeneously, as a crystal. Light acts, primarily and chiefly, as a means towards the first growth of the plant cell, by producing carbonic acid. The chemical elements are obtained by the plant, not by taking up the elements individually, but through the decomposition of binary compounds. In some early stages, the plant cells acquire cilia, and their motion and water rendered it for a long time uncertain whether to class them among animalculæ or plants. In this stage, and in all subsequent stages, heat appears necessary to the life of plants. The germs of plants and animals have many different attributes, but some the same. The rate of germination is regulated by heat, as the malster knows. The rate of the organising force in plants is dependent on a force coming from the outside. In the process of organising two things are important (1), simple growth; (2), development of parts. In the animal body, heat favours development, as is well shown by a comparison of the crustaceous forms of the polar regions with those of warm latitudes. It has been shown that by decreasing the temperature and abstracting light, the tadpoles may be prevented developing into the frog long beyond the ordinary period. So, in those creatures who are enabled to supply a fresh eye or a fresh tail for a lost one, the new eye or the new tail has been found to be produced in quicker time when the creature is favoured with a higher temperature of the surrounding atmosphere. It is, indeed, a question of temperature only; and heat appears to be the organising force. The plant obtains all its growth from the inorganic world—the animal from that and the plant, and then restores to the inorganic world all its original materials. Motion would seem to be the return which the animal body makes of the force derived by the vegetable from light and heat. The lecturer then alluded to the instructive and original suggestion of George Stephenson, that in coal we are getting back from the inorganic world the light and heat which vegetable life obtained originally from it. The question remains, Whence arises the extraordinary power of building upon organism? There must be some directing power in the original germ; and superadded to this, the labour that does the work, as heat, and according as it lasts will be the development. Dr. Carpenter summed up by observing, that external agencies have power in addition to the other powers of living beings. Being built up, life is, during its existence, constantly reproducing or returning to the inorganic world light and heat, so as to induce a belief in the circulation of forces, and in the principle insisted on by physicists of the conservation of force.

Professor H. E. Roscoe, on the measurement of the chemical action of the solar rays, was listened to with the interest which the professor usually imparts to any subject which he takes up. Perhaps this discourse was really the most important of the series hitherto delivered during the session—the value of all kinds of accurate measurement in science being the foundation in many cases of science itself. The technical character of the lecture requires, however, technical treatment, and will be displayed better than we can afford to display it in the photographic journals. Nevertheless some points must be noticed. The immense influence of the sun's rays on the earth is scarcely enough estimated, either upon its present condition or in remote geological epochs. The amount of the red or heating rays of the solar spectrum determine the thermal condition or climate of any place. The purple end of the spectrum it is which acts chemically. The character of the *fauna* and *flora* of a country depends on the amount of the chemical rays. No means of measuring these rays has hitherto been discovered. The chemical action of light is best demonstrated by experiments with the chloride of silver. But a union of the two gases, chlorine and hydrogen—forming hydro-chloric acid—is the most sensitive to light, exploding in common daylight. The lecturer illustrated this peculiarity of the gas by a few simple experiments. Phosphorus was burnt in a green glass globe, in the light proceeding from which a glass globe filled with hydrochloric acid, and hermetically sealed, was exposed. This green light had no effect upon the gas. The phosphorus was then ignited in a similar globe of blue glass, and the gas exploded immediately. The meter proposed is rather complicated, and from the necessity of nearly a week's labour before it can be used to any purpose, is not likely to be as yet practically efficient. It consists of three parts—1. Where the hydrochloric acid is generated. 2. Where it is exposed to the light in an insulated vessel. 3. Where the action of the light upon it causes a certain motion of water in a graduated tube. The lecturer asserted it to be a reliable instrument—the same results having been obtained at different times. He illustrated by diagram the chemical action of direct sunlight at Cairo, Naples, Manchester, Reyhiavik in Iceland, and Melville Island, at each 12 hours of day, by which it appears that at noon at Melville Island it may be called 5° or less, and at Cairo 105°. At Manchester it is about the mean, but at all the places at seven in the morning and five in the afternoon it is nearly equal. The chemical action of *diffused* daylight was calculated to be greatly different. At noon at Cairo it scarcely reaches 40°, it is at Melville Island 20°, while the gradations at early morning and in the evening are more abrupt. The lecturer concluded by some very suggestive observations on the plant and animal producing powers of a country, and which no doubt will be acceptable to the still advancing geologist.

Professor Faraday's lecture "On the application of the electric light to lighthouses," was crowded with all the talented rank and fashion of the metropolis, which the lecturer very humbly ascribed to the subject matter of the discourse. For many years past he has been connected with the Trinity House, and has had his earnest attention attracted to the matter. He alluded to many curious difficulties which occurred in establishing lighthouse illumination, and to the modes of getting over them. He gave a descriptive history of the various kinds of light which had been used, from the open beacon to the reflector, and thence to the cata-dioptric principle of Fresuel, illustrating the whole with actual examples, and finally applying the electric light—"my own spark"—to both constant and revolving lights. In the refracting apparatus introduced by Fresnel, the lecturer stated that it had been proved satisfactorily, that the angle of light should never, to be properly effective, be less than 6°, or more than 15°. He paid a well-merited compliment to the energy of Professor Holmes in his attempt to apply the electric light to the ordinary lighthouse system, and stated the fact, that for six months past, and up to within a very short time, when for some reason it was discontinued, the electric light had illuminated the South Foreland lighthouse, and that it had all that time been plainly observed from the coast of France, a distauce of some thirty miles.

RECENT PATENTS.

BOILERS AND SAFETY VALVES.

H. W. Harman, *Manchester.—Patent dated August* 19, 1859.

Mr. Harman has in the specification of this patent comprehended several important improvements in the arrangement of boilers, as well as an excellent modification of the safety valve.

Fig. 1 of the accompanying engravings is a partially sectional end view; and fig. 2 is a corresponding elevation of one modification of the improved boiler; fig. 3 is a partially sectional elevation of one arrangement of the improved safety valve. Referring to the modification of the boiler as delineated in figs. 1 and 2, the brickwork, A, in which the boiler, B, is supported is built in the usual manner; the boiler is in this example furnished with two internal furnace tubes, C, the wrought iron plates of which are riveted to external circular stays, D, of T iron. The contiguous plates of the furnace tubes are arranged so as to leave a small intervening space which is filled up with caulking. The front extremity of each of the furnace tubes, C, projects out beyond the end plate of the boiler, so that the ends of the furnace bars, E, are flush with the end plate. This arrangement, in addition to other advantages which it has, ensures the effective heating of the crown plates right out to the end of the boiler. The projecting portion of each furnace tube is secured to the boiler by means of exterual rings of angle iron, the weight of the tube being, however, mainly supported by the end plate of the boiler through which the tube passes. The front ends of the furnace bars, E, are carried on the inner end of a narrow dead plate, F, which fills up the space between the ends of the bars and the furnace

Fig. 1.

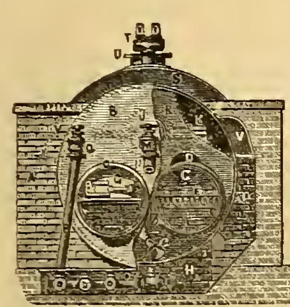
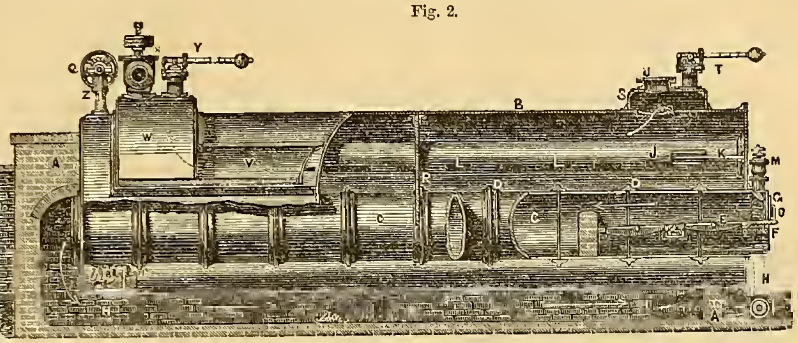
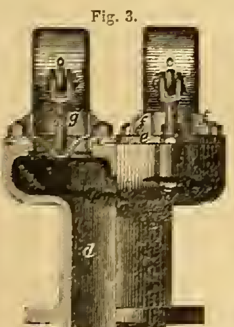


Fig. 2.



doors, G. The flame and heated products of combustion arising from the burning fuel pass along the furnace tubes, out at the backward ends and along the flue, H, beneath the boiler to the front part, thence upwards and along the lateral flues, I, to the chimney. The backward end of each furnace tube projects outwards a short distance beyond the end plate of the boiler, to which it is attached by means of angle iron, in manner corresponding to the arrangement of the front end. The end plates of the boiler are stayed internally by means of the longitudinal stay tube, J, which is arranged above the furnace tubes, C, the lower portion of its periphery dipping a little below the proper water level. The stay tube, J, is connected to the end plates of the boiler by means of angle iron riveted thereto; these angle irons are made in the form of two half rings, having laterally extending wing pieces to which are riveted the diagonal stays, K. These diagonal stays extend towards the stay tube, J, and are riveted to double pieces of angle iron on the sides of the stay tube, so as to stiffen the whole and render it exceedingly firm. This mode of staying the boiler internally by means of an internal tube provides in a very efficient manner for the longitudinal expansion of the boiler arising from the heat of the furnaces, at the same time it effectually resists the internal steam pressure. In some cases it may be preferable to use tubes of an elliptical, or polygonal figure in their transverse section in lieu of cylindrical tubes. The stay, J, has formed in it at the water level, a series of slots, L, by means of which the tube is converted into a scum trough or collector. The scum and other impurities thrown by the ebullition of the water to its surface collect in the tube, J, from whence they may be drawn off from time to time by means of the "blow-off valve," M, the casing of which is bolted to the front of the boiler. The blow-off valve case is connected to the pipe, N, which passes down between the furnace mouths and enters the waste pipe, O, which communicates with the lower part of the boiler, and conveys away the water when the boiler is required to be emptied. The water for the supply of the boiler passes up through the feed pipe, P, the passage of which is controlled by a valve Q, the inner extremity of the feed pipe being carried down towards the lower part of the boiler. To prevent the rising and falling of the furnace tubes, C, without, at the same time, interfering with their longitudinal expansion, they are supported centrally by the vertical stay or diaphragm, R; this stay consists of a wrought iron plate pendent from the roof of the boiler to which part it is riveted. On the front end of the crown of the boiler, is fitted the steam chest, S, and safety valve, T, contiguous to which is the man hole, U. Connected with the boiler is an improved arrangement for superheating the steam before it reaches the steam pipe which conveys it to the engine. The saturated steam as it rises from the water passes into the steam chest, S, which communicates with the longitudinal laterally projecting steam passage or superheating chambers, V. These superheating chambers are formed of iron plates riveted to the sides of the boiler, they are flat at the bottom which partly, rests on the brickwork, A, so as partially to support the weight of the boiler. In this manner the bottoms of the chambers, V, form the roofs of the lateral flues, I, from which they receive their heat. The steam as it passes along the chambers, V, has imparted to it an additional quantity of caloric from the heated plates forming the bottom of the chambers. The backward ends of the superheating chambers, V, communicate with the steam chest, W, which forms a segmental belt partially encircling the boiler in manner similar to the steam

Fig. 3.



chest, S. The steam passes out from the steam chest, W, by the steam pipe, X, the passage of which is controlled by a stop valve, contiguous to which is fitted a safety valve, Y. The superheating chambers, V, may, if necessary, be fitted with a cock at one end to draw off any water of condensation that may collect therein after the fires are drawn. If the superheating of the steam is not required the lateral chambers, V, then afford additional heating surface by opening a communication between the boiler and the chambers, so as to allow the water free passage thereto. In order to obtain a continuous circulation of the water, and so ensure the colder portion being effectively exposed to the more highly heated parts, the water is put in motion by means of a small propeller or wheel which is kept rotating while the boiler is at work. On the backward end of the boiler is fixed a hollow standard, Z, the upper part of which is forked and carries the bearings of a short horizontal spindle, *a*. To this spindle is keyed the pulley, *b*, which is driven by means of an endless belt from the engine. The spindle, *a*, has also fast to it the bevel wheel, *c*, which gears with the pinion, *d*, on the upper end of the vertical shaft, *e*, which extends down through the standard, Z, to a footstep bearing in the projecting part of the standard, *f*, which rests on the bottom of the boiler. At the lower part of the shaft, *e*, is keyed a bevel wheel, *g*, which gives motion to the pinion, *h*, fast to a short shaft carrying the propeller wheel, *i*. Upon the wheel, *i*, being put in motion, the water is caused to circulate in a continuous current which passes over the more highly heated portion of the furnace tubes, so as to equalise the temperature in all parts of the boiler, and thus avoid the unequal tension to which boilers are ordinarily subject to. The improved arrangement of the safety valves for boilers is shown in fig 3. The valve pipe or box, *j*, is of the usual kind, being sufficiently wide at the top to receive the arrangement for the duplex valves. The valve seating, *k*, is made of gun metal or brass, and is bolted to the upper face of the box, *j*; this seating has four or other number of vertical ribs, *l*, formed on it, the vertical edges of which extend to the opening in the valve seat. The ribs, *l*, form guides in which the valve, *m*, moves freely; this valve is of gun metal or brass, and is made of a cup-like form, the cylindrical part fitting the guides, *l*, and the bevelled edge being ground to correspond to the edge of the seating, K. The lower part of the valve forms a curved concavity to receive the lower end of the lever spindle, *n*, which is jointed to the weighted lever, O, the arrangement of which is as usual. This modification of the valve ensures steadiness combined with extreme sensitiveness to internal pressure; its arrangement offers no impediment to the escape of the steam, whilst the guiding parts, being placed outside, cannot become deranged by priming or any internal action in the boiler. The cylindrical figure of the upper part of the valve ensures its rising vertically from the seating, so that there is no liability of its sticking, nor can it twist in its guiding flanges. These several improvements admit of boilers being worked with greatly increased efficiency and economy.

WORKING RAILWAY BRAKES.

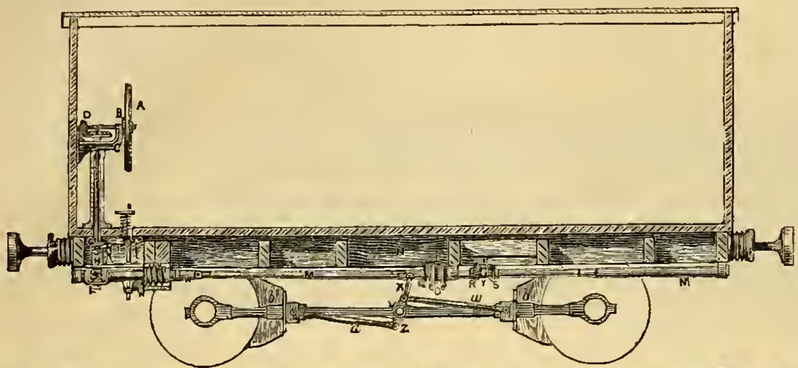
Charles Fay, *Manchester.—Patent dated February* 17, 1859.

The first part of this invention relates to improvements which are more particularly applicable to the brake-actuating mechanism for which Mr. Fay obtained letters patent, dated the 18th of December, 1856, and consists of various arrangements and combinations of mechanism for imparting a rotatory motion to the longitudinal brake rods of the train, whereby the brakes may be made partly self-acting and self-adjusting, so as to compensate for the wear of the blocks, whilst they are still free to be applied by the hand wheel of the guard when requisite. The patentee has also described and shown several modifications of the brake mechanism, as well as in the arrangement of the details, which our space will not admit of giving.

The accompanying figures represent the general arrangement of the partially self-acting brake mechanism as applied to the guard's van in conjunction with the ordinary well-known slide brake secured to the axle boxes.

Fig. 1, of the subjoined engravings, represents a longitudinal vertical section taken through the carriage framing; fig. 2 is a corresponding plan of the frame. This arrangement allows for the vertical play of the carriage framing, the brake slide and blocks being stationary

Fig. 1.



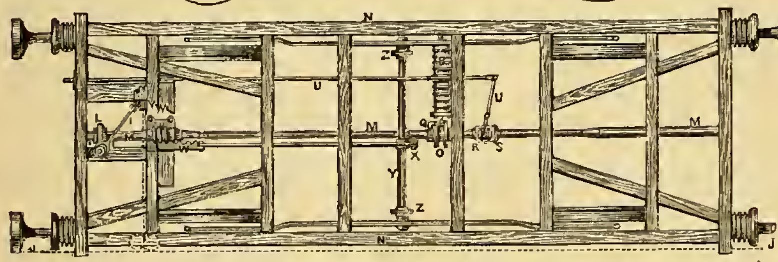


Fig. 2.

by reason of their attachment to the axle boxes. A, is the band wheel, to one of the arms of which is attached a catch or detent, B, which engages, when required, with the catch wheel secured to the bracket, C, in order to prevent the wheel, A, from revolving when the main springs, hereinafter mentioned, are compressed; the hand wheel shaft carries the bevel pinion, D, which gears into the bevel wheel, E. These wheels are used for working the brakes by hand, or for compressing the main springs, so as to be ready for instantaneous action. The bracket, C, is supported by a pillar, within which works the vertical shaft, F, carrying at its upper end the bevel wheel, E, before referred to. The vertical shaft, F, is made in two pieces or lengths, which are connected together by the sliding clutch, G, and box, H. The clutch, G, is slid up the vertical shaft by means of the foot treadle and lever, I, which liberate the clutch when pressed upon by the guard, or otherwise acted upon by the cord connection, J, between the several carriages of the train and the engine. At the bottom of the lower portion of the vertical shaft, F, is an endless screw, K, gearing into a pinion, L, fastened to the brake rod or shaft, M, which runs longitudinally beneath the centre of the carriage framing, N, and is supported in bearings bolted to such framing. The threads of this screw are at such an inclination as to allow the worm wheel, L, and shaft, M, to revolve freely without the necessity for disconnecting the screw therefrom, the screw being carried round when the clutch, G, is elevated by the rotation of the worm wheel. At or near the middle of the longitudinal shaft, M, there is formed a tube, carrying a chain drum, O, working loosely thereon, for compressing the main spring, P, of the self-acting mechanism, by means of a chain or rack. A catch or pawl is carried on the side of the loose chain drum, O, and serves to rotate or wind up that drum through the ratchet wheel, Q, fast on the tube of the brake rod, M. On one end of the same tube there is fixed a bevel wheel, R, gearing into the intermediate bevel wheel, working loosely on a stud pin, which wheel engages with the bevel wheel, S, fast on the other portion of the brake rod, M, which works within the tubular part of the brake rod, M, the whole forming, in conjunction with a sliding clutch, T, engageable with either of the wheels, R or S, a reversing motion, the clutch, T, being actuated by a lever and connecting rod, U. On the brake shaft, M, is keyed also the endless screw, V, gearing with the toothed rack, W, sliding in a suitable box or guide, and connected to the lever, X, by means of a rod. The lever, X, is keyed on to the centre of a transverse rocking shaft, Y, which carries two short arms, Z, severally connected by the pushing rods, *a*, to the brake blocks, *b*, which are forced apart simultaneously, and grip the peripheries of the wheels.

In applying the brakes by hand by the apparatus above described, the hand wheel, A, is rotated, so as to impart rotatory motion to the brake rod, M, in the opposite direction to the arrow, through the intervention of the bevel gearing, D and E, endless screw, K, and worm wheel, L. This rotatory motion of the brake rod imparts, through the endless screw, V, fitted or formed thereon, a traverse to the rack, W, which, being transferred to the lever, X, and transverse shaft, Y, effects the simultaneous action of the two brake blocks, *b*, upon the peripheries of the wheels.

When it is desired to apply the brakes by self-acting mechanism, the vulcanised India-rubber spring, P, is first compressed by turning the hand wheel, A, in the contrary direction to that required for applying the brakes by hand, or round the shaft, M. The ratchet wheel, Q, fast on the tube of the brake rod, M, then carries round with it, through its catch or pawl, the loose chain drum, O. This has the effect of coiling up round the drum a chain connected with the further end of the spring, P, and consequently compresses the spring, which is now set ready for action so soon as the brake rod, M, shall be released, or at liberty to revolve freely. This release is effected by depressing the treadle, I, in the guard's van, which depresses the lever, and disengages the clutch, G, from the box, H, whereupon the tension of the spring will uncoil the chain and rotate the pulley, O, carrying round with it (through the agency of its pawl and ratchet wheel, Q, the brake rod, M, thereby applying the brakes, *b*, in the same manner as when applied by hand, the sole difference being that the power is applied to the brake rod, M, through the ratchet wheel, Q, in place of through the worm wheel, L. The release of the brake rod may also be effected by pulling the cord, J, extending along the train, and connected to the end of the releasing clutch lever, I. By placing the brake rods in the centre of the carriages, and by combining therewith the reversing bevel wheels and clutch, R, S, and T, facility is afforded for working the brakes uniformly whichever way the carriages may be turned.

MANUFACTURE OF VARNISH AND LACKER.

THOMAS CATTELL, M.D., *London.—Patent dated June* 16, 1860.

THE manufacture of varnishes and lacker forms a highly important branch of industrial art, and since the introduction of the methylated spirit a considerable impetus has been given to the business in consequence of the increased demand. In the accompanying specification, Dr. Cattell gives us the result of his latest researches upon the subject.

This invention has for its object improvements in the manufacture of varnish and lacker, and consists in dissolving the gums or resinous bodies usually employed in, or suitable for the preparation of varnish and lacker, in solvents prepared by mixing alcohol, wood spirit, or methylated spirit, with coal tar, naptha, or volatile hydrocarbons, separated therefrom by distillation, or with volatile hydrocarbons obtained by the destructive distillation of peat, shale, and other bituminous matters. In preparing the solvents, the patentee prefers to distil the mixture of alcohol, wood spirit, or methylated spirit, and the volatile hydrocarbons employed. The manufacture is divided into two stages:—1. The stage involving the preparation of the solvents. But having regard to the chemical constitution of the agents herein employed, and their practical bearing upon the objects of this invention, it is important to consider them under the denomination of the two classes, namely, 1. The class of ethylated hydrocarbon solvents. 2. The class of methylated hydrocarbon solvents. In the preparation of ethylated hydrocarbon solvents, the patentee employs on the ground of economy "methylated spirit" in the place of pure alcohol; and in the preparation of methylated hydrocarbon solvents he employs pyroxylic spirit. It is essential to the proper blending of the alcohol or pyroxylic spirit with the volatile hydrocarbons specified, that they be dehydrated as much as possible before they are brought together. With this view, therefore, the ordinary alcohol "methylated spirit," or pyroxylic spirit of commerce is exposed to the action of dry carbonate of potash and chloride of calcium, in the proportion of two ounces of each salt to a gallon of spirit for two or three days, and afterwards submit them to distillation. Alcohol, methylated spirit, and pyroxylic spirit thus prepared, will mix with the volatile hydrocarbons herein specified, without producing but very slight, if any opalescence. The hydrocarbon, to which preference is given, is benzole; it should be perfectly clear and bright, and is mixed with the alcohol methylated spirit or pyroxylic spirit prepared as above described, in equal proportions. In place of benzole, rectified coal tar naptha may, for economy, be employed; hydrocarbons obtained from peat, shale, or other bituminous substances in a manner similar to that in which coal tar naptha is obtained from coal may also be employed; the patentee, however, recommends the use of benzole. But further, to determine a more fixed combination of the two liquids the patentee distils them together, adding previous to the distillation, seven ounces of caustic lime and one ounce of dried carbonate of potash to each gallon of solvent. When the distillation is complete the solvent is ready for use.

In the specification of letters patent granted to Dr. Cattell, on the 17th of February, 1859, for "improvements in treating and purifying gutta percha," a process is described producing a by-product consisting of a mixture of alcohol, methylated spirit, or pyroxylic spirit, and benzole, or coal tar naptha; this mixture, in order to obtain a solvent suitable for varnish making, is digested for a day or two with occasional agitation with a mixture of seven ounces of caustic lime, and one ounce of dried carbonate of potash to each gallon of fluid, and afterwards submitted to distillation.

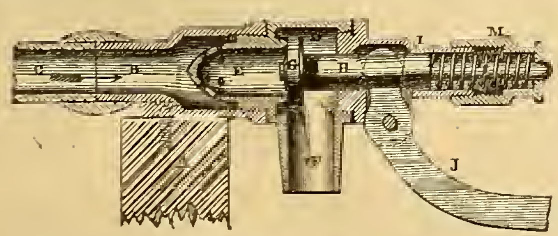
The following are the compositions of different varnishes prepared with these solvents. 1. Carriage varnish:—copal, 28 oz.; amber, 8 oz.; camphor, ½ oz.; ethylated hydrocarbon solvent, 1 gallon. 2. Varnish for external use:—copal, 28 oz.; amber, 4 oz.; animé, 4 oz.; camphor, ½ oz.; ethylated hydrocarbon solvent, 1 gallon. 3. Furniture varnish:—copal, 24 oz.; shellac (bleached), 8 oz.; olibanum, 4 oz.; camphor, ½ oz.; ethylated hydrocarbon solvent, 1 gallon. 4. Picture varnish:—copal, 20 oz.; damar, 12 oz.; mastic, 8 oz.; ethylated hydrocarbon solvent, 1 gallon. 5. White hard varnish:—copal, 8 oz.; mastic, 16 oz.; sandarac, 4 oz.; camphor, ½ oz.; ethylated hydrocarbon solvent, 1 gallon. 6. French polish:—shellac, 32 oz.; ethylated hydrocarbon solvent, 1 gallon. 7. Another French polish:—Shellac, 32 oz.; olibanum, 4 oz.; ethylated hydrocarbon solvent, 1 gallon. 8. Varnish for prints and maps:—mastic, 16 oz.; sandarac, 16 oz.; Canada balsam, 4 oz.; ethylated hydrocarbon solvent, 1 gallon. Varnish for iron—(to be applied hot):—resin, 12 oz.; sandarac, 16 oz.; seed lac, 6 oz.; ethylated hydrocarbon solvent, 1 gallon. Preparation of lacker:—1. Sandarac, 26 oz.; shellac, 6 oz.; turmeric, 6 oz.; gamboge, 1 oz.; ethylated hydrocarbon solvent, 1 gallon. 2. Seed lac, 18 oz.; amber (fused), 6 oz.; gamboge, ½ oz.; dragon's blood, 1 oz.; saffron, ½ oz.; ethylated hydrocarbon solvent, 1 gallon. 3. Seed lac, 8 oz.; copal, 4 oz.; sandarac, 12 oz.; turmeric, 2 oz.; aloes, 1 oz.; gamboge, 1 oz.; dragon's blood, ½ oz.; ethylated hydrocarbon solvent, 1 gallon.

VALVULAR APPARATUS.

Thomas Craven, *Scarborough.—Patent dated August* 27, 1859.

The patentee has specified under these letters patent an improved arrangement of floating ball cocks or valves, such as are ordinarily used for regulating the height or level of water in cisterns, and fluid holders of various kinds.

The accompanying figure is a vertical section of one modification of the improved valvular arrangement for controlling and regulating the flow of water into cisterns or other similar reservoirs or holders. As here arranged, the valvular apparatus is screwed or otherwise attached to the edge or other horizontal surface of the tank or cistern, A. On the inlet or backward portion, B, of the cock is cast on the lower part a laterally projecting plate, which is bored and countersunk to admit of its being screwed to the vertical part, A, of the cistern. To the outer end of the inlet pipe, B, is soldered the ordinary service pipe, C, through which the water flows to the cistern. The inner portion of the inlet part, B, is enlarged in diameter and tapped internally to receive the externally screwed end of the middle portion, D, of the tap. The end of the part, D, which screws into the inlet portion, B, is extended beyond the screw and formed into a rose-bead or perforated diaphragm, E, the partial closure of the passage serving to ensure a steady flow of water, and prevent the admission of any large particles or impurities that may be carried into the service pipe. The tubular passage beyond the diaphragm, E, opens into the enlarged central part of the tap which forms the valve chamber; the valve seat is formed by extending the metal of the part a little beyond



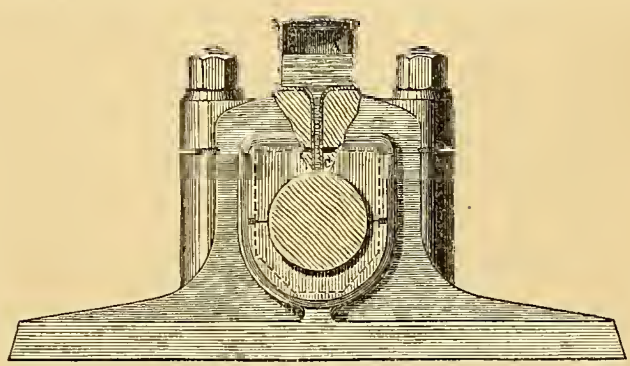
the enlargement so as to form a projecting ring against which the valve acts. Opening out from the lower part of the valve chamber is the outlet pipe, F, which in this modification is arranged in a vertical direction, the water falling therefrom into the cistern or other receptacle. The valve, G, is a disc of metal, the face of which, next the valve seat, is covered with a piece of vulcanised India-rubber or other soft yielding material, so as to ensure a water-tight junction when the valve is pressed against the seat, E. The spindle, H, of the valve, G, extends out through the central portion, D, of the cock and through the end piece, I, which is screwed into the part, D. This end piece, I, is of tubular form, with a lateral opening in it to admit the upper end of the rod, J, which is jointed to the end piece by a screw-pin passing through it. The upper end of the rod, J, passes up through a slot made for the purpose in the valve spindle, H. The lower extremity of the rod is furnished with the ordinary copper float, or ball, the rise and fall of which opens or closes the passage of the water way. To assist in keeping the valve up to its seat, the spindle, H, is prolonged outwards beyond the end piece, I; a helical spring, L, is passed over the reduced part of the spindle. One end of the spring, L, presses against the shoulder of the spindle, H, and the other against the inner end of the nut, M, which is screwed on to the end piece, I. The external thread on the end piece, I, admits of the nut, M, being screwed up so as to temper or adjust the force of the spring, and thus ensure the due and proper closure of the inlet. Upon the water in the cistern being partially or wholly drawn off, the drag of the water on the ball is at all times sufficient to ensure the withdrawal of the valve, G, from its seating.

Ball cocks, or tubular apparatus, arranged and constructed upon this plan are exceedingly simple, inexpensive, and very easily fixed, the internal parts being at all times readily accessible either for inspecting or cleansing.

LUBRICATING MACHINERY.

J. H. Johnson, *London and Glasgow;* M. Boniere, Junr., *Paris.—Patent dated May* 18, 1859.

These improvements relate to an improved system, or mode of, and apparatus for, lubricating the journals of rotatory shafting, or spindles, and is based upon the attraction produced by the rapid rotation of a journal, the rotation producing a vacuum in the lower end of a tube which is connected with a reservoir containing the lubricant, and is in



communication also with the journal to be lubricated. The reservoir is covered with an air-tight lid, and the lower end of the tube is fitted with a perforated disc, the number of perforations being regulated according to the speed of rotation of the journal.

The accompanying engraving represents a partially sectional elevation of the improved lubricating apparatus applied to an ordinary plummer block. The oil cup, A, is closed by a hinged or other lid or cover to exclude the air, and is terminated by a tube, B, which passes through the cap of the plummer block, and through the upper brass, and rests freely upon the journal to be lubricated. This tube, B, is terminated by a metal disc perforated with small holes, C, the number of which varies according to the speed of rotation of the journal. The external atmosphere being excluded, the oil will be held suspended; but on the rotation of the journal, a sucking action is produced which causes the oil to pass through the small perforations, C, in the end of the tube, B. The forms of the oil cups may obviously be varied to suit the different pieces of mechanism to which they may be applied.

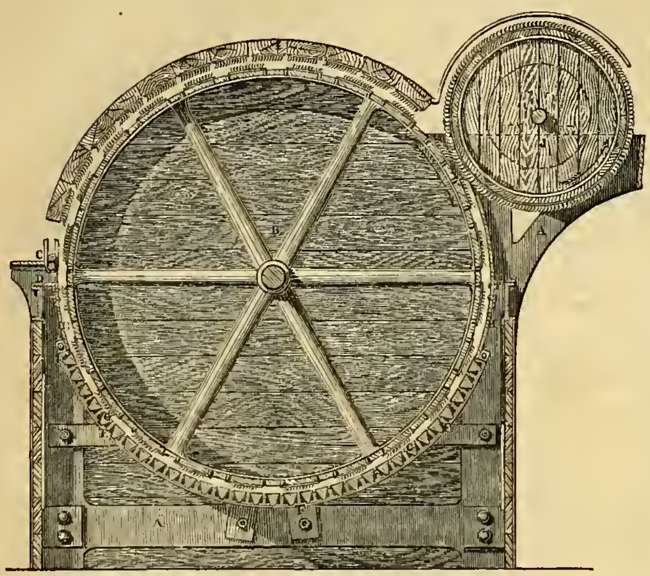
CARDING MACHINERY.

David Todd, *Bridge of Weir, Renfrew.—Patent dated August* 29, 1859.

Mr. Todd's improvements consist in so arranging and constructing carding engines or machines used for the carding, treatment, or preparation of fibrous materials of various kinds—but especially cotton—that great loss by waste of material is prevented, whilst the carding and straightening of the fibres is performed in a manner superior to the existing practice.

Fig. 1 of the subjoined engravings is a sectional elevation of one modification of a carding machine, having the patentee's improvements applied thereto. Fig. 2 is a vertical section of a portion of the details drawn to an enlarged scale, and fig. 3 is a plan, corresponding to fig, 2.

Fig. 1.



The framing, A, of the carding machine is arranged in the ordinary manner, so also is the main carding cylinder, B. At the part immediately below the feeding rollers or "licker in," C, there are bolted to the top rail of the framing, inwardly projecting brackets, D. To these brackets is riveted a metal plate, E, which extends along the engine parallel to the main cylinder, the surface of the plate, E, being curved to conform to its periphery. The ends of the plate are bolted to a segmental frame, F, which is fitted at each end of the carding engine. The segmental frame at each end of the carding cylinder is, by preference, made in two parts, the inner ends abutting against each other. The frame is made of cast iron, and it has laterally projecting pieces, which are slotted for the convenience of attaching it to the framing of the carding engine, and of accurately adjusting it to the main cylinder, B. The inner surface of each of the segmental frames, F, next the cylinder is formed with rectangular notches or recesses in it, as is more clearly shown in the enlarged views, figs. 2 and 3. Into these recesses are fitted a series of bars of metal or other material, G; these bars are, by preference, of a triangular figure in transverse section. The bars, G, are arranged with their flat surfaces next the cylinder, B, and they are disposed so as to leave a space of one-eighth to five-sixteenths of an inch between the contiguous bars. The ends of the bars, G, are made of a rectangular figure, so as to fit into the recesses in the supporting segmental end frames, F. In this way the lower part of the carding cylinder, B, is enclosed by the series of parallel bars, which extend nearly half way round the cylinder. Above the bars, G, on the doffer side of the engine, is fitted a curved plate, H, which is carried by the brackets, I, that are bolted to the framing of the engine, corresponding to the arrangement of the curved plate, E, on the opposite side. The curved plate H, is made much deeper than the plate E, so that it extends nearly up to the doffer, J, and forms, a curved shield to prevent any waste of the fibrous material before reaching the doffer. In this way, as the cotton or other fibrous material to be carded is carried into the engine by the rotatory action of the "licker in" rollers, C, it is carried round by the main cylinder, B. The rotatory action of the cylinder, B, carries the fleece of fibrous material over and in contact with the bars, G, which has the effect of effectually separating from it the dust and small refuse particles. These waste matters pass through the interstices between the bars, G, and fall on to the floor beneath. In this manner every portion of the useful fibrous material is delivered in a clean and thoroughly carded state on to the doffer, J, and a considerable saving in the material is thus effected.

Fig. 2.

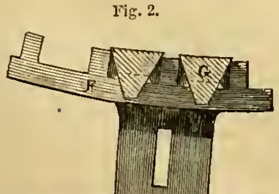
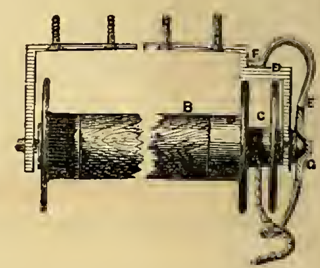


Fig. 3.

SILENT SPRING BLIND.

Caleb Vinall, *Brompton, London.—Patent dated December* 13, 1859.

This invention comprehends an ingenious arrangement in which the advantages of the spring blind are obtained with the ordinary wooden roller. The accompanying figure represents an elevation of both ends of the roller. The bracket, A, in which the roller, B, works is of the ordinary kind, and is secured by screws in the usual way. The roller, B, has at one end of it two parallel discs, which form the pulley, C, through the central part of this is passed a cord, which is made fast to the pulley. The laterally projecting end of the spindle is fitted into the pendent end of the bracket, D, which differs only from the other bracket in having an extra bend to admit of its passing over the pulley, C. A spring, E, which is fastened to the bracket, D, at F, has a bend formed in it at G; this part presses on the projecting part of the spindle of the pulley. As the blind is drawn down, the cord which is fastened through the pulley wheel, C, is wound on to the wheel, so that when it is pulled the blind is drawn up, and by the pressure of the spring on the centre of the pulley wheel, it is retained in any position required. The drawing down of the cord on the pulley, C, consequently winds up the blind. When required to be taken down, the spring is pressed back, by the end left for that purpose, clear of the head, and the roller is then free.



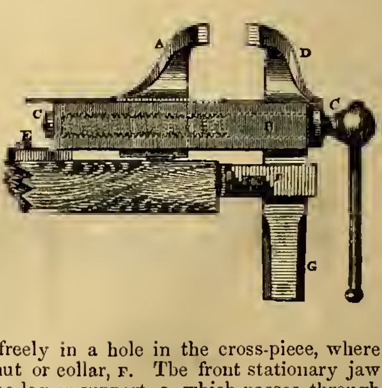
The arrangement can be made either right or left handed. It may also be arranged by applying another pulley wheel in the place of the ordinary end, with another cord so as to do without the cord in the centre of the blind, as now generally in use. It can also be made to carry any size of blind, for either inside or outside.

PARALLEL VICES.

R. F. and E. Drury, *Sheffield.—Patent dated August* 30, 1859.

The patentees have, in this invention, arranged the parts of the vice so as to obtain a cheap and simple mode of combining the slides with the moveable jaw, as also the combination of the body of the vice with the leg.

The accompanying figure represents a side elevation of the improved standard vice. A, is the moveable vice jaw which is slid to and fro along the slide bars or rails, B, by the screw spindle, C. These bars are forged at their front ends on to the sides of the front or stationary jaw, D, and are connected at their opposite ends to the surface of the bench by a screw, as shown at E. A cross-piece, is also forged on to the bars at this end, for the purpose of connecting them together, and maintaining them parallel to each other. The screw spindle, C, which works loosely through a hole in the stationary jaw, D, passes through a nut or tapped hole made in the tail of the moveable jaw, and revolves freely in a hole in the cross-piece, where it is retained by an external nut or collar, F. The front stationary jaw is forged in one piece, with the leg or support, G, which passes through a clip for securing it to the edge of the work-bench, and is supported at its lower extremity upon a stone or wood block, let into the floor of the workshop. Plates are secured to the front and back of the moveable jaw for the purpose of protecting the screw from filings or dirt. The bench vice is of the same construction as the standard vice, with the exception that the leg or support, G, is dispensed with.



APPARATUS FOR REFRIGERATING AND HEATING LIQUIDS.

David Mathews, *Leeds.—Patent dated July* 8, 1859.

The patentee's improvements comprehend the arrangement and construction of a refrigerating apparatus, which is applicable also as a heater or evaporator, whereby greater simplicity of construction and efficiency of action are combined with the advantage of an entirely self-acting apparatus.

Fig. 1 of the accompanying illustrations represents a partial longitudinal section and side elevation of one form of the apparatus, as applied to the cooling of wort, with the middle portion broken away. Fig. 2, is a vertical transverse section of the apparatus taken near the centre; A, represents a continuous trough or gutter, the bottom of which is inclined at a gradient of about 1 inch in 20 feet. This gutter may be made of light cast iron, wood, or other suitable material, and may consist either of one long trough with the bottom inclined from one end to the other, or of a wider and shorter trough divided longitudinally down the centre to form two gutters, channels, or troughs, or it may be of a circular or other form, in plan, in lieu of rectilinear; but the patentee prefers to construct it in the manner shown—namely, a straight trough divided longitudinally down the centre by walls or partitions, the partitions and outer sides of the trough being level on their upper edges. The centre partition extends from the upper end of the trough to within a short distance of the bottom end, so that one channel will communicate with the other at the bottom end. On the inclined bottom of the trough is laid a series of light tinned copper or other refrigerating pipes, B, arranged side by side and extending longitudinally along the bottom of the trough. These pipes are severally connected at each extremity by ground union joints to the boxes, G; the two boxes, G, being placed at the top and bottom of the incline, that is, one in each channel. These pipes pass through a series of transverse bars or bridges, I, the bridges being made of sufficient length to extend across each channel or trough upon the bottoms of which they rest, and consequently serve as supports to the pipes. Each of these bridges is connected by means of bolts to a triangular frame of light wrought-iron, and these frames are connected in pairs by means of bolts to a cross bar, J, the bolts being jointed to the apices of the triangular frames. Each of the several cross bars is suspended by chains, K, passing over central guide pulleys in the overhead supports. The chains at the extreme ends of the trough are wound a few turns round drums fitted with winch handles, L, and ratchets and detents,—a counter weight being hung to the free end of the chain after it leaves the drum. The intermediate chains may be simply passed over a second guide pulley, but have each a counter weight attached to them. The object of this arrangement is simply to afford ready facility for raising the entire series of pipes and boxes bodily out of the trough when occasion may require. E, represents the water inlet pipe, which is connected to the box, G, at the bottom of the incline by a short length of flexible pipe or hose. The water outlet pipe, F, is similarly connected by flexible hose to the box, G, on the top of the incline. The flexible connections are requisite in order to admit of the elevation of the pipes and boxes as described. C, represents the inlet pipe, D, for the wort which is to be refrigerated; this pipe opens laterally into the top end of the trough behind one of the boxes, G; and D, is the outlet pipe for the cooled wort, which opens from the bottom of the trough, at the bottom of the incline, behind the second box, G. The oblong openings in the boxes, G, are to allow of the free passage there through of the wort. At the inlet or top of the incline the whole of the wort passes through these openings—the box fitting the trough or gutter accurately at that part; but at the outlet end or bottom of the incline, the box is raised slightly above the bottom of the trough by small feet, so that the wort is free to flow off under the box, whilst any superfluous quantity will pass off through the apertures. A discharge cock is fitted to the box at the bottom of the incline for the purpose of drawing off all the water from the pipes when required.

Fig. 1.

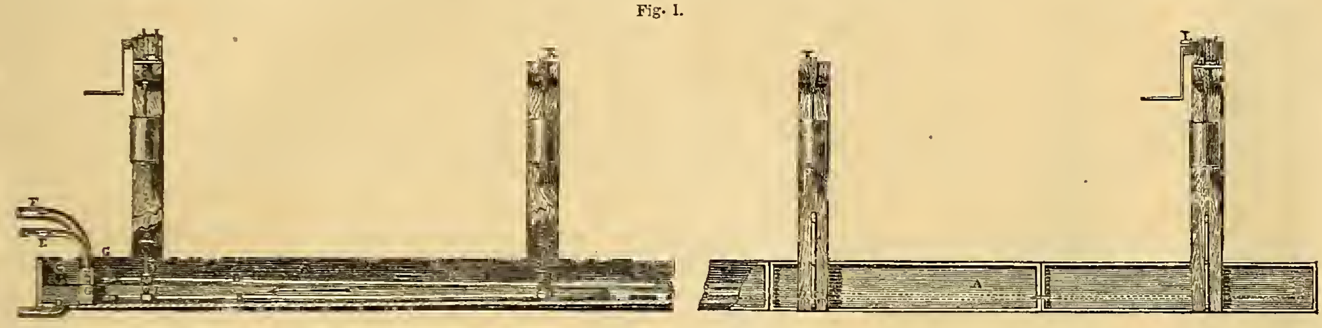
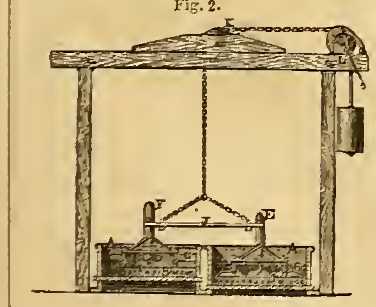


Fig. 2.



The action of this apparatus is as follows:—The pipes and boxes being deposited in their proper places on the inclined bottom of the trough or gutter, the hot wort is admitted by opening a cock or sluice in the inlet pipe, C, and flows through the apertures in the box, G, and down the trough or gutter in the form of a broad but shallow stream of just sufficient depth to cover the cooling pipes, B; this, however, is further ensured by the bridges, I, which act as dams or weirs, and consequently dam up the wort at intervals, causing it to flow over the tops of the pipes. On arriving at the bottom of the first gutter or trough, the wort flows round the end of the central partition, B, in the direction of the curved arrow, and passes along the second gutter, returning to the front end of the main trough again, when it encounters the second box, G, at the lowest part of the incline. Here it flows partly under the box and partly through the openings made therein, and finally emerges by the outlet pipe, D, perfectly cooled; the refrigerating effect being due partly to the extended and shallow nature of the stream, but mainly to the cooling action of a constant current of cold water which flows through the interior of the pipes, B, in a contrary direction to the flow of the wort. The cold water first enters the box, G, by the pipe, E, at the bottom of the incline, passes thence to the group of pipes connected therewith, and is conducted by these pipes to the large box, G, at the opposite end of the main trough. From this box the water passes into the second group of pipes, and finally enters the box, G, at the top of the incline, whence it escapes by the outlet pipe, F.

In order to allow of the wort being entirely drained off from the gutters small notches are made in the under sides of the bridges by which means any wort remaining in the gutters after working the apparatus is free to drain off.

SIGNAL LIGHTS.

J. H. Johnson, *London and Glasgow* (M. M. Silas & P. Ogier, *Paris*).—*Patent dated August* 8, 1859.

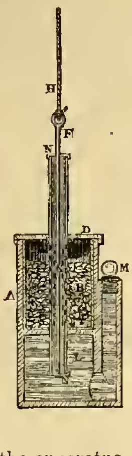
In carrying out this invention it is proposed to apply the spontaneous combustible properties of phosphuretted hydrogen to the production of signal lights, for which purpose any phosphuret is applicable, but more particularly the phosphuret of calcium and the phosphuret of barium. The phosphuret is enclosed in a hermetically sealed vessel, or chamber, so constructed as to admit of the introduction or entrance of water therein when the gas is required to be generated. When intended to be used at sea or on the water this vessel is made buoyant by being attached to a float, or by having a requisite quantity of air contained therein, and according to one modification, is provided with a tightly stoppered tube at the top and at the bottom—the bottom one serving for the admission of water when the vessel is floated on the surface, and whilst the other tube at the top allows the gas, generated by the admixture of the water with the phosphuret, to escape and become inflamed by contact with the air. On casting the apparatus into the water, the stoppers of the tubes are perforated by the withdrawal through them of a wire attached to a cord, or otherwise, when the generation of the gas will immediately commence by reason of the entrance of the water into and among the phosphuret.

When required for use on land, two vessels, or a divided vessel, may be used, the upper portion containing water, and the lower one the phosphuret; a pipe and stop-cock connecting the two, so that water may be readily admitted to the lower vessel at pleasure by turning the stop-cock. This peculiar light is admirably adapted for use at sea in stormy weather, as it is not affected or extinguished either by wind or moisture.

Fig. 1 of the subjoined engravings is a vertical section of the simplest form of apparatus to be used at sea, and adapted to life buoys. A, is a cylindrical metal box, the interior of which is lined or coated with enamel, in order to prevent the contact of the phosphuret, B, with the metal. A neck or mouthpiece, C, is formed on the cover, D, which cover is soldered on to the cylinder after the phosphuret has been introduced. E, is a lead or other soft metal diaphragm soldered on to the neck of the cylinder. Through this diaphragm is passed a wire, F, the inner end of which is connected with a cock, or stopper, G, in the neck of the cylinder, which stopper may be provided with a sharp, circular, cutting edge, or perforator, on its upper surface, so that on the wire (which is connected by a cord, H, to the ship) being suddenly withdrawn by the casting overboard of the apparatus, the cock, or stopper, will be pulled out, and the cutter, or perforator, will penetrate a hole in the soft metal diaphragm, and allow the water to enter freely into the interior of the cylinder during its momentary immersion, and, by mingling with the phosphuret, produce the flame desired, which will continue to burn with an intense light from the mouth of the cylinder until the whole of the phosphuret is decomposed. In order to prevent the phosphuret from becoming accidentally displaced or shaken, it is proposed to insert a wire gauze diaphragm, I, above it, inside the cylinder.

Fig. 1.

Fig. 2.



It is intended to use this apparatus in connection with any suitable life-buoy or float, so that after the first plunge, on being cast into the water, it will float on the surface, and serve as a beacon, signal of distress, or otherwise. According to another modification of this apparatus, it is adapted to be used with the ordinary life-buoys of the Royal navy. A tube, similar to K, in fig. 2, is passed through the top and bottom of the cylinder, A, and projects sufficiently below the bottom of the cylinder to project through the barrel or hollow light supporting stanchion of the buoy, the cylinder itself resting upon the top end of the stanchion, at a slight elevation above the water. The tube is perforated with numerous holes at the part within the cylinder, and is closed at the top and bottom by a lead diaphragm, through which a wire is passed. The bottom end of this wire has a small knob formed upon it, whilst its upper end is connected by a cord with the ship. The apparatus, which is fixed to the buoy on being cast overboard, causes the cord to be pulled, and the wire to be withdrawn; this withdrawal of the wire leaves a perforation or aperture in each of the lead diaphragms, and as the lowest one is some distance below the surface, the water, by the constant oscillation of the buoy or float and apparatus, causes the water to rise up in the tube, and passes through the lateral perforations into and among the phosphuret contained within the cylinder, A. The inflammable gas thereby produced escapes at the upper end of the tube, where it burns with a bright flame in spite of wind or water. Fig. 2 represents a vertical section of a smaller apparatus, suitable for use either at sea, when hoisted at the mast head or yards of a ship, or as a signal or beacon on land when placed in any elevated position. This instrument is of a similar construction to that already described, with the addition of the second or lower chamber, or compartment, L, containing water which is introduced therein by the lateral pipe and mouthpiece, M. The lower end of the tube, K, dips into the water in the chamber, L, and when the wire, F, is withdrawn, and a perforation thereby made in the diaphragm, K, the water rises up the tube, K, and enters among the phosphuret, N, in the upper chamber, A, through the lateral openings made in the tube, K. Phosphuretted hydrogen gas is immediately generated, and on its escaping by the upper end of the tube, K, into the atmosphere, it ignites spontaneously, and burns with a bright and powerful flame, which continues a longer or shorter period according as more or less phosphuret is contained in the apparatus. Rings are secured to the sides of the chamber, A, for the facility of attaching ropes or halyards, or hoisting it to the top of a mast or pole. Fig. 3 represents a vertical section of a modified form of apparatus, to be used for railway, or other signals, both on land and sea, where a powerful and unextinguishable light under control is required. In this apparatus, he prefers to make the vessel, A, of a spherical form, although any other shape may be given to it. Above this vessel is placed a water chamber, L, which communicates by means of the pipe and stopcock, M, with the vessel, A, below, containing the phosphuret. A second pipe and stop-cock, N, connects the upper portion of the chamber vessel, A, with a tube, K, which passes through the water chamber or vessel, L, and serves as the burner for the gas. O, is the nozzle or mouthpiece through which the water is introduced into the water, L, and P, is a similar but larger mouthpiece made in the vessel, A, for the introduction of the phosphuret, both apertures being closed by screwed plugs or other convenient tight-fitting stoppers. Q, are feet which may be cast upon the vessel, A, so as to form a tripod or support for the apparatus. The size of the burner (which may be either moveable or fixed) is regulated according to the size of flame jet required. The respective vessels, A and L, having been charged with phosphuret and with water, as shown, the cocks, M and N, being first closed, the apparatus is ready for use. When required to be put into operation, the cocks, M and N, are opened, and a supply of water is thereby allowed to enter the vessel, A, and mingle with the phosphuret, the resulting phosphuretted hydrogen gas escaping through the cock, N, into and out of the tube or burner, K, and becomes spontaneously ignited on coming in contact with the atmosphere. The gas cock, N, may be kept shut if desired, so as to confine the gas until required for use, when, by opening it, an instantaneous light is obtained. In this way the apparatus may be always kept charged ready for use on a sudden emergency, and the jet may be shut off again when no longer needed, to be again used when necessity requires. The immense lighting power of this apparatus, which casts its brilliancy and reflections vertically as well as horizontally, makes this light particularly useful on lines of railways or roads where curves are frequent. In such cases the reflection may be seen at a distance of several miles from the place where it is working. Fig. 4 represents a vertical section of the top of a simplified form of the last described apparatus, the upper water vessel being here dispensed with. This apparatus consists simply of a vessel, A, containing the phosphuret, B (same of fig. 1), and provided with a neck or mouthpiece, C, formed on the cover, D, which is soldered on to the vessel. Into this mouthpiece is screwed tightly the short tube or burner, K, which is provided with a stopcock, N. The phosphuret is introduced through the mouth, C, and the tube or burner, K, is then screwed firmly into its place, as shown. When required for use water is injected by means of a syringe, or other suitable apparatus, applied to the end of the burner, and when a sufficient quantity has been introduced, the cock, N, is closed, and the apparatus is then ready for instant service. On opening the cock, N, again, the gas will escape by the burner, and become ignited as hereinbefore described. Fig. 5 represents a vertical section of the top of a somewhat similar apparatus to that last described, but adapted for use as a submarine light or lamp for visiting the screw, keel, or other part of a vessel, or for conducting submarine operations, or searches, as in the case of wrecks or laying submarine foundations for structures. In this apparatus the nozzle of the tube or burner, K, is surrounded by a concentric pipe, O, which extends slightly above the end of the burner. This concentric pipe is connected by a branch, P, with a flexible pipe, Q, leading to an air pump at the surface. The object of this addition is to supply the atmospheric air indispensable for combustion under water to the light, by forcing air down the pipe, Q, which air is brought in contact with the light by means of the concentric tube, O, surrounding the burner. The apparatus connected with fig. 5 is intended to be employed as a submarine light, and is not connected with any oxygen supplier. When required for service as a submarine light, it receives the necessary air by the pipe, Q. But the same instrument may be used on land with the same concentric pipe. In this case, however, the tube, Q, is connected with an oxygen gasometer. By this additional and forced supply of oxygen the brilliancy of the flame is very greatly increased beyond what it would be were it supplied merely by the oxygen contained in the surrounding element. If a regular, steady, and more brilliant light is required, the burner may be surrounded by a glass

Fig. 3.

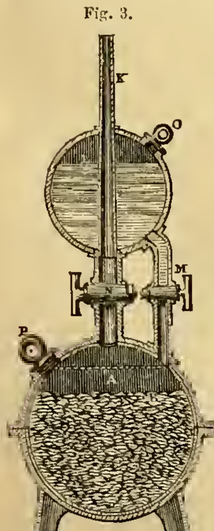


Fig. 4.

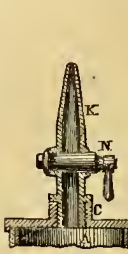
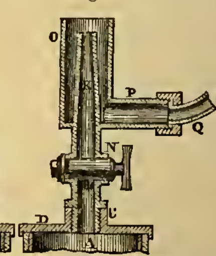


Fig. 5.



shade, in which case a tube or chimney should be provided for the escape of the smoke produced by the combustion. If found desirable, the brilliancy of the light may be still further increased by connecting the tube, Q, with an oxygen gasometer, whereby pure oxygen may be mixed with the phosphuretted hydrogen gas issuing from the burner, K. When this instrument is used in infected water, such as occurs in certain rivers and in sewers, the gas issuing from the burner should be directed against the putrescent matter at the bottom when its neutralising or disinfectant properties quickly annihilate the infection. This means of supplying oxygen gas round the burner may be also applied to the signal light apparatus we have described and illustrated. These instruments may also be placed in coloured glass shades in order to augment the combinations of signals when required for such purposes; but, in this case, the shades ought to be made very strong, and of large diameter, as the gas in burning forms a vaporous deposit which may interfere with the transparency of the glass.

When oxygen gas is supplied to the flame, glass shades should not be employed, as the explosive power of the oxygen may cause the breakage of the glass. In cases, however, where oxygen gas is employed, a wire gauze cylinder, similar to that used in the Davy safety miners' lamp, is fitted on to a suitable support, and made to surround the burner in order to prevent the diffusion of the oxygen. As oxygen gas possesses the property of greatly increasing the combustible and lighting power of phosphuretted hydrogen gas, it will be understood that this admixture is only desirable where an intense light is required.

Signal apparatus, constructed on the principle hereinbefore described, when required for military or naval purposes, may be used in groups composed of different numbers, and of plain or coloured lights, by the addition of variously coloured glass shades, so that by suitably combining or arranging them, telegraphic signals may be transmitted to great distances. But a more simple mode of communicating telegraphic messages would be to use one of the strong lights, which, by illuminating a group of soldiers or inanimate objects, signals could be represented, and might be seen at very long distances, the light in this case serving to illuminate the signal.

Reflectors may also be combined with these lights either at sea or on land, but they should be placed sufficiently far behind the focus to prevent the polished surface of the reflector from becoming dimmed by the action of the vapours arising from the combustion.

Another modification of this important and useful apparatus is constructed in the form of a hollow shot or shell. The body of the shell may be made of wood or thin metal. It is composed of two halves screwed together tightly, and provided with a central division piece, which divides the internal cavity into two separate and distinct compartments or chambers. In the upper chamber is fitted a thin metal receptacle for containing the phosphuret, the mouth of this receptacle being covered by a wire gauze diaphragm, as in fig. 3, to prevent the phosphuret from being shaken out. A metal neck or mouthpiece is screwed into the top of the upper chamber, and this mouthpiece, which corresponds to that shown in fig. 1, is covered by a disc or diaphragm of lead soldered thereon. Through this disc a wire passes and enters a cork or stopper, into which it is firmly secured. The outer end of the wire is connected to a cord, as in fig. 1, for the purpose of withdrawing it when required.

The lower chamber is made perfectly air and water tight for the purpose of imparting buoyancy to the shell, and it is weighted by a plate of metal inserted into the bottom, to ensure the shell floating with its mouth upwards. This shell may be used as an alarm in case of fog, or as a signal in war, or as a powerful light for illuminating the coast and exposing an enemy's fleet. It is intended to be fired from a gun or mortar, the act of firing withdrawing the wire by means of the cord, which should be secured to the gun or other convenient fixed point, so that when the shell drops into the sea the water will enter the upper chamber, and mix with the phosphuret contained therein. The gas then generates and burns at the mouthpiece, whilst the shell floats on the surface of the water. This shell may also be made to convey documents, letters, or despatches, which may be inserted by an opening in the lower or air chamber, and tightly stopped before firing. In cases of distress, the fate or situation of a ship may thus be readily made known to any ship in the neighbourhood, which would be instantly attracted by the intense light of the burning shell. The shot being reduced to small proportions, can even be used as a bullet, and fired from a gun or rifle, or used as a rocket. Moreover, it could easily be adapted as a light and fired from a mortar used on the coast at lifeboat stations, thereby serving to point out the position of the rope sent to it or from the vessel.

It is obvious that various forms of apparatus may be employed in carrying out the main features of this invention, the sole desideratum required, being a ready means of introducing water, or of allowing water to introduce itself, into and among the phosphuret contained in any suitable receptacle, and, therefore, we have given the annexed engravings as examples of some of the various means which may be adopted for putting the said invention into practice, the arrangement not being confined to the arrangements shown.

LAW REPORTS OF PATENT CASES.

Registered Design—Shade for Candlesticks—Infringement—Injunction—Turner *v.* Tucker.—This was a motion before Wood, V.C., for an injunction to restrain the defendant from manufacturing, selling, or exposing, or offering for sale, or exporting or otherwise disposing of shades for candlesticks, to which was applied the registered design of the plaintiffs, or any design in fraudulent imitation thereof, or any shade or shades for candlesticks, having the upper part thereof curved or bent inwards, or to which was applied the said registered design, or any design being an imitation thereof, or only colourably differing therefrom, or from in any way pirating or infringing the said design of the plaintiffs. The facts of the case, as proved, were these:—On the 25th March, 1859, the plaintiffs registered a design of a shade for candlesticks, as a useful design pursuant to the 6 & 7 Vict., c. 65, and obtained the requisite certificate of registration. The following cut, fig. 1, illustrates the plaintiffs' design. A description accompanied the design in these words:—"A, is the shade, the lower part of which is encircled by a band or ring of metal, B. The lower part of the shade is of a size to fit into the socket of a candlestick or other holder. The purpose of utility arising from the shape and configuration of the new parts of this design is, the protection afforded to the candle from draught through the shape of the shade, A. None of the parts of this design are new or original, with respect to the shape and configuration thereof, except that marked, A. Drawn to a geometric scale."

Fig. 1.

In July, 1859, the plaintiffs having reason to believe that the defendant intended to manufacture and sell shades for candlesticks, similar to their registered design, caused a notice to be served on the defendant, cautioning him from so doing, but, notwithstanding that notice, the defendant made and sold several shades for candlesticks, of the shape and configuration shown by the two following cuts, figs. 2 and 3. The last-mentioned shades were in the month of September, 1859, registered by the defendant as new and original designs. These were the alleged infringements of the plaintiffs' design. The case of the defendant was, that the alleged design of the plaintiffs consisted solely in the shape or configuration of that *part* of the shade shown by the curving or bending inwards of the upper part of the shade, and not in the shape or configuration of the *entire* shade. And in order to show want of novelty of the upper part of the plaintiffs' shade, the defendant put in as evidence of prior publication of that part, the specification of an invention of Edmund Price Spiller, for which letters patent were granted on the 3d September, 1856, for improvements in the construction of chamber lamps, the drawing to which specification discloses a glass shade, which is illustrated by the following cut, fig. 4. The defendant also proved prior use by Mr. Neighbour of a glass shade for a candlestick, which is illustrated by the following cut, fig. 5. These figures are drawn to a somewhat smaller scale than figs. 1 to 3. The plaintiffs' counsel contended that the design of the plaintiffs was for the shape or configuration of the *entire* shade, and was not confined or restricted to the shape or configuration of the upper part, as delineated by the curving or bending inwards of that part. The Vice-Chancellor made the following order:—The plaintiffs, by their counsel consenting to abide by any order the court might make as to damages that might be occasioned to the defendant by reason of that order, and also undertaking forthwith to bring such action as he should be advised, with regard to the matter in question, that an injunction should be awarded to restrain the defendant, his servants, agents, and workmen, from selling, or offering for sale, or otherwise disposing of shades for candlesticks, to which was applied the registered design of the plaintiffs, or any shade or shades for candlesticks, to which was applied any design only colourably differing from the said design of the plaintiffs, until the further order of the court. Liberty to apply.

Fig. 2.

Fig. 3.

Fig. 4.

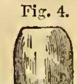


Fig. 5.

Sir Hugh Cairns, Q.C., and Mr. Lawson, (instructed by Mr. J. Henry Johnson, of Lincoln's Inn Fields, London, and Glasgow,) were counsel for the plaintiffs, and Mr. Rolt, Q.C., and Mr. Freeling for the defendant.

The Leather Cloth Company (Limited) *v.* Dodge.—Injunction.—This was a motion for an injunction to restrain the defendants from manufacturing, or selling, or carrying on any company, or manufactory, having for its object the manufacture or sale of the fabric called leather cloth, heretofore manufactured by the plaintiff's company; or any fabric or production similar thereto, or any productions or production in any way similar to the productions which are the subjects of certain letters patent in the bill mentioned, and which, at the date of an agreement in the bill also mentioned, were being manufactured in the plaintiff's manufactory at West Ham, in Essex. The material facts of the case were these:—Previously to, and at the date of the agreement before referred to, the defendants were shareholders in an American company, called "The Crockett International Leather Cloth Company," and acted as the agents of that company in England, for the sale of Crockett's leather cloth. Leather cloth had, long previously to the date of the agreement, been manufactured in America, and imported into England. On the 20th October, 1855, letters patent were granted to the defendant Dodge, for "improvements in machinery or apparatus for spreading or distributing waterproofing, or similar compositions, over webs or sheets;" and on the 14th January, 1856, letters patent were also granted to the defendant, Dodge, for "improvements in the preparation or manufacture of leather cloth." In May, 1857, the defendants and others, who were interested in the American company, and in the business carried on by the defendants, as their agents, and also in the before mentioned letters patent, agreed to sell the same to the plaintiff's company, and an agreement in writing was entered into by the several parties. Among others, the agreement contains the following article:—"That the parties of the first part (which include the defendants) or any of them would not, directly or indirectly, carry on, nor would they to the best of their power, allow to be carried on by others, *in any part of Europe*, any company or manufactory having for its object the manufacture or sale of productions in any way similar to the productions which were the *subjects of the said letters patent*." It was proved by the affidavits, filed on behalf of the defendants, that at the date of the letters patent of 1855 and 1856, that leather cloth was not a *new* manufacture, and it was contended by the defendants that the *subjects* of those letters patent were not the manufacture of leather cloth in general, but that one was for *machinery* to be used in the manufacture of that fabric, and the other was for a process for *tanning* the cloth, and giving it the appearance of tanned leather. Counsel for the plaintiffs submitted that the agreement prohibited the defendants from manufacturing or selling any kind of leather cloth. The Vice-Chancellor, Wood, without hearing the defendant's counsel, observed that there was a serious difficulty as to the agreement being in restraint of trade. He apprehended that with respect to the general question involved as to the restraint of trade, the law was that no man could be restrained from selling goods unless by the operation of a patent, or by his own contract. Another principle was that a man could not enter into a contract to that effect, except within certain reasonable limits, as to locality; until it was otherwise decided in a court of law he must adhere to that view. The order would be, the defendants' undertaking, neither directly nor indirectly, to sell "Crockett's patent leather cloth," the motion to stand over, with liberty for the plaintiffs to bring such action as they might be advised Sir Hugh Cairns, Q.C., and Mr. W. P. Murray, were counsel for the plaintiffs; and Mr. Rolt, Q.C., and Mr. Karslake, instructed by Mr. J. Henry Johnson, of Lincoln's Inn Fields, and Glasgow, were counsel for the defendants.

Sewer Pipes: Whitton *v.* Jenings.—This was a motion on the part of the plaintiff, in the Vice-Chancellor's Court, before Sir R. T. Kindersley, for leave to bring an action for the purpose of trying his legal right to a patent which he had taken out for making hollow sewer and other pipes. It appeared that in April last the plaintiff discovered the alleged infringement by the defendants, and, having made inquiry, in May wrote to them upon the subject, and filed this bill in August for an injunction to restrain such infringement. In November the defendants put in their answer, and had filed affidavits, whereby they alleged that the patent had been obtained in an unfair manner from a servant of one Blanchard, by a breach of confidence In the month of February, before the time arrived at which the defendants could have moved to dismiss the bill for want of prosecution, the plaintiff gave notice of this motion, and also that he should read the answer, but had made no affidavit himself. The defendant opposed the motion, contending that the object of this application was to prevent the bill being dismissed for want of prosecution. There had been an acquiescence by the delay which had taken place, and the patent was not now, the invention being in fact that of the defendants. In reply it was argued that the plaintiff had considered an affidavit unnecessary, and, to save expense, moved on the pleadings. The Vice-Chancellor said that the ordinary course was, with respect to injunctions for the infringement of patents, in order to enable the plaintiff to get the benefit of his legal right, either to leave the plaintiff simply to his legal remedy, or grant the injunction. He might, however, see cause to dismiss the motion, or give special directions; but if the defendants' case supported by oath, either on answer or affidavit, was that the patent was invalid, as not being novel, but that the plaintiff derived his notion from information unfairly, not fraudulently obtained—for here there did not appear to have been any injunction as to keeping the secret—the plaintiff was bound to pledge his oath that he was the inventor, and that there was no foundation for the charge of unfairness. In this case, after waiting three months, the plaintiff made this application without so pledging his oath. As it appeared, however, that no such affidavit was made, because it was considered to be unnecessary, he should let the motion stand over that such an affidavit might be filed; but it must be such as to satisfy the mind of the Court upon the subject.

The Patent Type Founding Company (Limited) *v.* Walters. Same *v.* Lloyd.—Inspection. Patent Law Amendment Act 1852, Sec. 42.—A rule had been obtained in each of these actions by the plaintiffs, calling upon the defendants to show cause why the plaintiffs should not be at liberty to inspect type belonging to the defendants, and, if necessary, to take specimens of the same, for the purpose of being analysed, in order to ascertain if it was an infringement of the plaintiffs' patents. Inasmuch as the same question was involved in both the rules, it was agreed, at the suggestion of the Court, that they should be argued together. The section of the act relied upon enacts, that "In any action for the infringement of letters patent it shall be lawful for the court in which such action is pending, if the court be then sitting, or if the court be not sitting, then for a judge of such court, on the application of the plaintiff or defendant respectively, to make such order for an injunction, inspection, or account, and to give such direction respecting such action, injunction, inspection, and account, and the proceedings therein respectively, as to such court or judge may seem fit." Affidavits were used on both sides. And in the course of the argument the cases of Holland *v.* Fox and Morgan *v.* Seymour were referred to. The Lord Chief Baron and Barons Martin, Bramwell, and Channell, were unanimous in discharging the rules. The rules sought not only inspection by the eye but also analysis, and the court had no power to grant that. Inspection ought not to be granted unless the cases are such that a Court of Equity would grant an injunction. Here there was no evidence of infringement.

Bickford *v.* Binning.—This was an action for the alleged infringement of letters patent granted to Joseph Westwood, in 1854, for "a method of protecting iron ships and vessels from corrosion and animal and vegetable matters." In 1858, the plaintiff (who then had become the proprietor of the patent) entered a memorandum of alteration and disclaimer as to part of the patent, and the invention, as altered and disclaimed, consisted of first laying on a layer or coating of black varnish and then a layer of asphalt.

The evidence given at the trial on behalf of the defendant went to show that black varnish is merely pitch or tar dissolved in a solvent after the spirit and oil are got rid of, and that the defendant had applied to several ships a wash composed of ninety-five per cent. creosote and rectified naphtha, and five per cent. India-rubber or caoutchouc, and over this laid on the asphalt. Among the witnesses examined were Drs. Letheby and Penney, and Mr. Warrington, the chemist to the Apothecaries' Company. The evidence given was very conflicting, and the jury returned a verdict for the defendant.

Meadows *v.* Kirkman.—In this case the Court of Exchequer granted a rule for the defendant to show cause why the plaintiff (who is the patentee of an invention for a new mode of veneering woods) should not be at liberty to attend at the defendant's manufactory, and inspect the manner in which the defendant veneered his pianofortes.

Hills *v.* The London Gas Light Company.—Mr. Baron Bramwell read a very long and elaborate judgment upon the rule obtained by the defendants, affirming the judgment given for the plaintiff.

REGISTERED DESIGNS.

IMPROVED GLOVE.

Registered for Messrs. J. & J. Watts & Co., *Manchester.*

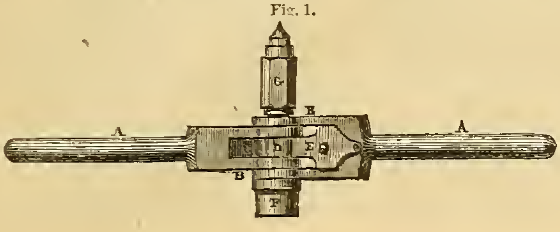
The improvement obtained by the registered shape or configuration is, that the material for making a glove is cut in one piece, so that it can be made up by simply sewing the two sides together, thus producing a glove with one seam only up the band. The only additional pieces employed in making up the glove, are one side piece to the forefinger and to the little finger, and two side pieces each to the other fingers; also a piece for binding the top of the glove.

COMBINED RATCHET BRACE.

Registered by Messrs. Easterbrook and Allcard, *of Albert Works, Sheffield.*

Messrs. Easterbrook and Allcard, of Albert Works, Sheffield, manufacturers, have introduced and registered a ratchet brace so constructed, that by working the two handles at the same time the action of the brace is rendered continuous, whereby nearly, or quite double the number of small holes can be drilled in a given time than with the ordinary ratchet brace. If large holes are required, two men can work the brace

Fig. 1.



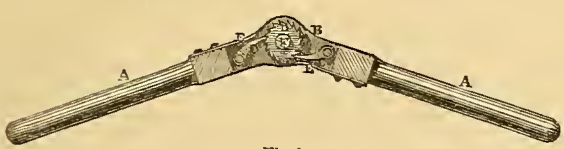
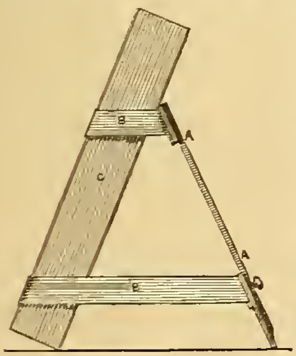


Fig. 2.

and maintain a continuous motion. If the holes are too large to be drilled by one man, two men can work in unison with each other, thereby rendering the tool a very powerful single-action ratchet brace. Fig. 1 is a vertical elevation of this ratchet brace, showing the handles extended; fig 2 is a horizontal section corresponding to fig. 1, showing the position of the spring pawls. A, are the handles; B, the forked ends between which the pawls, C, are secured; these pawls are kept pressing against the ratchet wheel, D, by the springs, E, which are screwed to the forked ends; and F, is the socket of the spindle with its box screw, G.

PHOTOGRAPHIC BATH STAND.

Registered for Mr. James Alexander Forrest, *Lime Street, Liverpool.*



Mr. Forrest has, in this design, furnished the photographer with a capital arrangement of a bath stand. Our illustrative figure represents a side view of the improved bath stand supporting a glass bath. The stand, or support, A, is made of metal, wood, or other inflexible material. Two bands, B, of India-rubber, gutta percha, or other elastic fabric, substance, or material, are passed round the bath, C. By means of these elastic bands, the bath may be set at any required angle to suit the operator's convenience, whilst portability and economy of space have been carried out to the utmost extent.

MECHANIC'S LIBRARY.

Algebra for Colleges and Schools, 2d edition, cr. 8vo., 7s. 6d. Todhunter.
Algebra, Manual of, part I., fcap. 8vo, 2s. Galbraith and Haughton.
Architecture Vitruvius, "Weale's Rudimentary Series," new edition, 5s.
Arithmetic and Algebra, 7th edition, cr. 8vo, 10s. 6d., cloth. Smith.
Arithmetic of Decimals, adapted to decimal coinage, 2d edition, 1s. 6d. Bryce.
Atlas of Plates, illustrated, "Weale's Rudimentary Series," 4to, 7s. 6d. Abel.
Builders' Price-Book for 1860, 8vo, 4s. sewed. Taylor.
Crompton, Samuel, Life and Times of, second edition, 8s., cloth. French
Decorator, the Universal, edited by Ross, illustrated by Gibbons, N. S., vol. i., 7s. 6d.
Embroiderer's Book of Design, royal 8vo, 2s. 6d., boards. Brothers De la Motte.
Engineer's Handbook, post 8vo, 5s., cloth. Lowndes.
Engineers, Useful Information for, 3d edition, revised, 10s. 6d. Fairbairn.
Fractional Calculator, 4th edition, 12mo, 4s., boards. Page.
Geometry, Elements of, simplified and explained, 2s., cloth. Cooley.
Machinery, Construction and Working of, "Weale's Rudimentary Series," 1s. 6d., sewed.
Mathematical and Physical Tracts, cr. 8vo., 7s. 6d., cloth. Lord Brougham.
Mathematics, Elementary, Part I., Algebra, 4th edition, 3s. 6d. Elliott.
Mechanics, Elements of, including Hydrostatics, 8s. 6d., cloth. Newth.
Railway Masonry, Guide to, revised by Cowen, 9s., cloth. Nicholson.
Readiest Reckoner Invented, 12th edition, by Rooks, 2s. 6d., cloth. Simpson.
Ship, History of a, from her Cradle to her Grave, new edition, 3s., cloth
Telescope, its construction and use explained, fcap. 8vo, 1s. Slugg.

REVIEWS OF NEW BOOKS.

Geology in the Garden, or the Fossils of the Flint Pebbles. By Henry Eley, M.A. With Illustrations. Bell and Daldy, London.

Geology has opened, and is still opening up much which is interesting. From the grand problems connected with the superposition of rocks to the grander problems connected with the origin and life of living beings, a constant succession of marvellous facts is presented to contemplation, and which, of themselves, produce bewilderment, even in the clearest heads. It may be that we are not yet quite certain as to what facts really are before us, that we are thus confusing our minds; or that a real fight has begun between old and new knowledge, and that our pre-judgment is operating to the injury of our judgment in general, which is, or ought to be, a very plastic commodity, liable to be altered as reason demands. In whatever new form geological truths are presented they are interesting; and he deserves well who renders them familiar. Our author, in his little well-written and elaborated volume, has principally brought familiarly before the mind the great glacial theory; and, while following the grand masters of the science, has not hesitated to work it out, in the speciality before him, in his own way.

He has gone thoroughly, although in a popular way, into the subject of the fossils found in flints more particularly, and a dozen or more of very carefully executed and well-fitted plates, exhibit the author's knowledge and care.

We could very profitably extract much from his pages, but the following must suffice. It explains something not commonly known:—

"Many of the larger flints, upon being broken, will be found to have cavities within them containing a mealy substance, either loose or adhering more or less firmly to the surrounding stone. This dust is, now and then, almost all fossils, and is seldom altogether without them. For the display of them, however, a peculiar treatment is required. A small quantity of the powder must be put into a phial, or, which is better, a test tube, and carefully washed—that is, shaken up—with several supplies of fresh water, which are to be successively poured off until no milkiness appears, but only the heavier sediment, which sinks to the bottom. It is necessary to separate this residium again into two different parts, the coarser and the finer, or it cannot be examined quite successfully. This may be done in various ways, but in no manner so readily, perhaps, as by means of a piece of a chemist's glass tube, or pipe, a few inches long and a quarter of an inch, or less, in diameter. Hold the finger tight upon the top of the pipe, so that the air contained in it may keep out the water, and lower it down into the test tube until the end of it is just over the sediment. Lift the finger off for a moment, and the water will rush into the pipe and bring the sediment with it. Close the pipe with the finger again, and the water and the sediment in it may be drawn from the test tube together. Suffer the first drop, into which the larger fossils will instantly sink, to fall off upon a piece of slate, or other smooth substance of a dark colour; and let a second drop, with the sediment which comes next, deposit itself on a piece of glass: there will still be a finer residium. The larger fossils can be picked out with a needle by the aid of a double glass: with the smaller there must be a differnt mode of proceeding. Dry the water from them thoroughly, by holding the glass over a candle. Then put some [Canada] balsam upon one side of another small piece of glass, which should be just large enough to cover the whole of the fossils easily, and drop it down upon them. With a split cork, as a pair of tongs, hold the two glasses, for a few minutes, in a horizontal position over the flame of a candle, keeping them as hot as you possibly can without actually boiling the varnish; and when cold, if all has been properly managed, the balsam will be firmly set, and the fossils in it, between the two glasses, quite transparent. They can then be sufficiently well seen with a Coddington lens, by holding them up against the light.

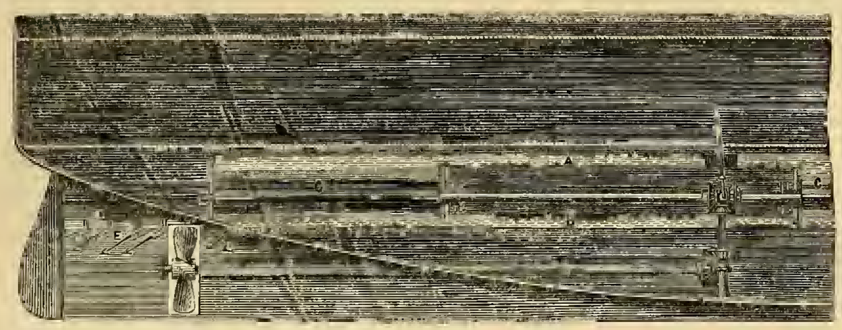
The soft chalk used by carpenters and in schools for marking on boards may afford similar specimens. It may be soaked for a few days and then gently brushed under water. The resulting sediment may be washed and proceeded with in the same way as directed respecting the dust from the flint cavity."

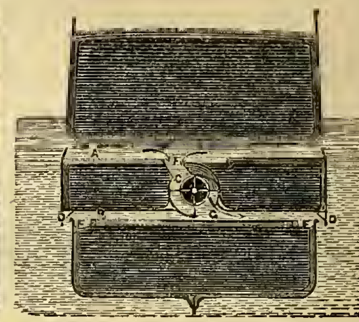
The work is, in every respect, "got up" in a commendable manner, while type and paper are both of the best.

CORRESPONDENCE.

PROPELLING VESSELS.

I beg to draw your attention to my invention for propelling vessels by the motion of the waves, which consists in taking advantage of the difference of level between the tops of waves and the bottoms or troughs between the waves, so as to obtain and utilise a fall of water to effect the propulsion. I form in the sides of a vessel two ranges of apertures, as shown in the figures. One series, A, is above the water line, and the lower range, B, below, with their openings to incline towards the stern, which will assist in propelling the vessel forward. The upper range is free to admit the water; the lower range is fitted with valves, E, which prevent the ingress of water, but permit free egress where the water is lower outside than within the vessel. The water admitted





by the upper openings is conducted through the duct, F, to the water power engines, C, forcing them round by the pressure of the column of water. These engines are connected by means of gearing with the propeller shaft, to which they communicate motion; and may, by means of a hand lever, be reversed for backing, or disconnected altogether for stopping or modifying the speed. The water, after acting on the engines, C, escapes by the duct, G, passing through the channel, B, and out by the valves, E. These valves open outwards, and they are protected externally by the pendent guard or protector, D, which prevents the valves from being kept closed by the external pressure of water. Sufficient reservoirs, to form an effective working column of water, are provided between the admission openings and the water power engines, as also between the escape ducts of the engines and the outlets to the sea.

The form I propose to build the vessels is much longer than usual, and the broadest part at the stern. I am not particular what kind of engine is used, but am of opinion that that shown in the figures would work very well.

J. Needham.

Picadilly, March, 1860.

THE USE OF KITES IN SAVING FROM SHIPWRECK.

So long ago as the year 1831, I entertained the idea that kites might be made very serviceable in operations at sea, and particularly in cases of shipwreck. Occasionally since that time I have made various experiments, resulting in my obtaining provisional protection, in August last, for an invention which I now consider complete, and for which I have since secured

a patent. In almost all cases of shipwreck the accident occurs upon a lee shore, and the first and great difficulty which presents itself is to establish a communication between the vessel and the land. This has hitherto been attempted chiefly by lifeboats, or the use of Captain Manby's apparatus, often fruitlessly, and always requiring the co-operation of persons on shore. My chief object was to render the ship independent of external aid, by having on board an apparatus which should safely and expeditiously convey to the shore both men and contents of the vessel. Thus, when the misfortune has occurred, a common sized kite is to be elevated in the usual way on board the vessel. When a sufficient quantity of line is veered out to enable the kite to remain suspended in the atmosphere, the end of the line on board is attached in a peculiar manner to the back of another and larger kite. This second kite is then suffered to ascend, and the end of its suspending rope is attached in a similar way to the back of a third and still larger kite, and this process is repeated till any required amount of elevating and tractive power has been attained, the size of each succeeding kite being limited by convenience.

When a sufficient power of elevation and traction has been attained, a light boat of basketwork or other materials capable of containing one or more persons is attached to the suspending rope of the last kite. More rope is then veered away, and the light boat with its cargo will eventually reach the land in safety, no matter how high the waves may be. The boat is to be suspended from the kite line by a block or pulley in the bow and another in the stern, and when it has reached the shore, the person it contains descends, and retaining in his hands a lighter rope attached to the bow, he suffers the boat gradually to return to the ship, which it will soon do in consequence of the elevation of the kite line from the diminished weight which it has to support, but which result is also secured by a rope attached to the stern of the boat, the end of which has been retained by those on board the shipwrecked vessel, and can be hauled on by them when necessary. Another cargo is now placed in the boat, and the person on shore hauls on the line which he has retained, and soon brings the second freight to land. In this way all the passengers, crew, and cargo may be saved. The kites are generally of a hexagon shape, made of linen, calico, or other materials so constructed as to be easily taken asunder and packed in boxes occupying very little space. This invention is also applicable to various other purposes, such as the propulsion of vessels in conjunction with sails or steam, to the raising of sunken ships, or, indeed, to almost any purpose where a nearly unlimited power of traction or elevation is required.

E. J. Cornner.

Derramore, Belfast, March, 1860.

THE "ORINOCO" STEAMSHIP.

A statement, headed *Orinoco* in the Monthly Notes of your January number, under "Marine Memoranda," has just been brought under my notice; and as it is calculated, through the wide circulation of your valuable journal in the scientific world, to induce an erroneous impression—damaging to the reputation of my uncle as her builder, I trust you will permit me to make a few observations upon some of the passages, and, in justice, kindly insert them in your next number.

The ship was built in 1851, and, therefore, not "quite recently" as stated. She was sold last summer, and has consequently been eight years hard at work. She was only intended originally for an eight years' ship, and any who knows the regularity with which she always performed her voyages, the extraordinary demand upon her services throughout the Crimean war, and the comparatively very small extent of her repairs, will see at once that she has neither been an expensive vessel in her maintenance, run her course too soon, nor come into the hands of the shipbreaker at a "very early stage of her existence."

As regards the statement that "dry rot has rendered her useless," and was the cause of her being sold, nothing can be more erroneous. The facts are (and I am surprised they have not been before explained, and the erroneous statement contradicted elsewhere), the engines were taken out of her to be placed in a larger ship—the *Paramatta*—one of three vessels just built for the Royal Mail Packet Company, to give increased accommodation; and she was sold because larger ships were required for the service, and there was consequently no further use for her.

I have visited the vessel whilst at Mr. Castle's yard, and have no hesitation in stating, that her only defects were such as an ordinary repair would have removed. The whole of this vessel's top timbers and the greater part of her upper framing and internal and external planking were of Dantzic fir; yet only in the way of the boilers, from the excessive heat and the effects of steam, was there evidence of decay, but not to any great extent. The other parts of the vessel, from the keel to the third futtocks, both plank and timbers, were nearly in as good a state of preservation, and the fastening as sound, as the day she was launched, excepting immediately in the fore and after run of the ship, where dirt and wet filth had been allowed to accumulate and remain; and in those parts there were some symptoms of decay in the timbers, but no "dry rot," and which a trifling expenditure would have remedied.

I enclose a letter from Mr. Castle, and having permission to insert it, I shall feel obliged if you will do so, in proof of the foregoing statement.—I am, sir, your most obedient servant,

HENRY S. PITCHER.

February, 18th, 1860.

I have much pleasure in replying to yours dated yesterday, respecting the state of the *Orinoco*, which I am now breaking up. I do not find her as described in the *Practical Mechanic's Journal*. There are a few places in her frame and in front of the boilers, where the timbers are defective; and taking her on the whole, I consider her a sound ship, and might easily be repaired, provided a profitable employment could have been found for her.—I remain, dear sir, yours truly,

HY. CASTLE.

Henry S. Pitcher, Esq.,
Dockyard, Northfleet.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL SOCIETY.

FEBRUARY 9, 1860.

"On the resin of *ficus rubiginosa*," by Mr. W. De La Rue, and Dr. H. Müller.

"Analytical and synthetical attempts to discover the cause of the differences of electric conductivity in wires of nearly pure copper."

"On a new method of substitution; and on the formation iodobenzoic, iodotoluic, and iodanisic acids," by Mr. P. Griess.

FEBRUARY 16, 1860.

"On the expansion of metals and alloys," by F. Crace-Calvert.

"Description of an instrument, combining in one a maximum and minimum mercurial thermometer," by B. Stewart, Esq.

MARCH 8, 1860.

"On the solar diurnal variation of the magnetic declination at Pekin," by Gen. Sabine. This communication was illustrated by various diagrams.

"The Bifilar magnetometer, its errors and corrections," by Mr. J. A. Brown.

CHEMICAL SOCIETY.

FEBRUARY 2, 1860.

"On an iron sand from New Zealand," by Dr. Gladstone.

"On the composition of air from Mont Blanc," by Dr. Frankland.

"On diniodacetic acid," by Messrs. Perkin and Duppa.

FEBRUARY 16, 1860.

"On some derivatives of the olefines," by Dr. Guthrie.

Dr. Odling, hon. sec., made a verbal communication "On the conversion of hydrochloric into hypochlorous acid, by direct oxidation."

ROYAL INSTITUTION.

FEBRUARY 3.

"On the mineral treasures of the Andes," by F. Field, Esq.

FEBRUARY 10.

"On species and races, and their origin," by Professor T. H. Huxley.

FEBRUARY 17.

"On the influence of science on the art of calico-printing, by Professor F. C. Calvert.

GEOLOGISTS' ASSOCIATION.

5 Cavendish Square.

MARCH 5.

"On the geology of Whitecliff Bay in the Isle of Wight," by Mr. Mark Norman.

"On a stalactite found in some flagstone rock near Hastingden," by the Rev. L. H. Mordacque.

GLASGOW PHILOSOPHICAL SOCIETY.

FEBRUARY 22, 1860.

"Remarks on glass painting," by Mr. C. H. Wilson.

MONTHLY NOTES.

MARINE MEMORANDA.

Great things are talked of with reference to the *John Penn*, Dover mail packet. She accomplished the run the other day from Blackwall to Dover, a distance of 89 miles, in five hours and seven minutes, or at the rate of nearly 18 miles an hour. The same evening she conveyed from Dover to Calais 220 boxes of India and Australia mails (nearly six tons). It had been previously determined by the authorities at the Post Office, in consequence of the great increase in bulk of the India mail, to have two packets at Dover, the one to convey the regular mails and passengers, and the other—the *John Penn*—to convey specially the Indian mails. The whole of the 220 boxes were conveyed from the railway to the vessel, and shipped in less than half-an-hour, and the *John Penn* accomplished the distance from Dover to Calais (21 miles) in 1 hour and 23 minutes.

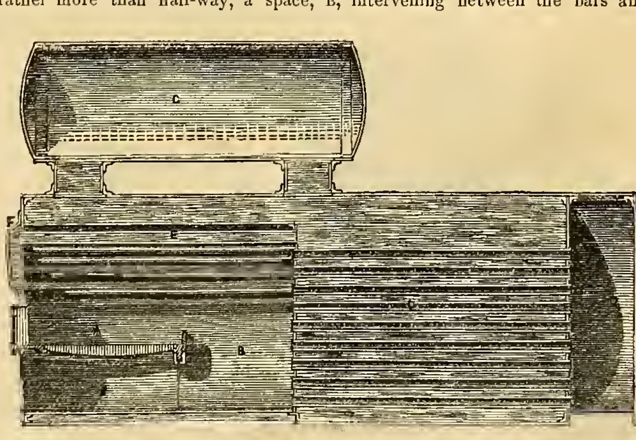
At the present moment there are 48 screw ships of the line, 25 frigates (screw), and 9 paddle frigates, 9 screw block ships, 16 corvettes (screw), 45 screw and 35 paddle sloops, 169 screw gunvessels and gunboats, 8 screw floating batteries, 18 screw and 43 paddle transports, troop ships, tenders, yachts, &c., and 4 screw mortar ships and floats afloat, making 345 screw and 111 paddle ships, and giving a total of 456 vessels. There are also 11 ships of the line, 9 frigates, 4 iron-cased ships, 5 corvettes, 15 sloops, 23 gunboats, which are either undergoing the process of conversion or are being built. Of effective sailing ships of the line we have 15 and 22 frigates, of which 12 and 6 are respectively fit to be converted. In addition to these there are 22 sloops and 84 mortar vessels and floats still propelled by sails; making a grand total of 666 steam and sailing vessels, of which 599 are now afloat.

The following particulars clearly indicate the enormous progress of the port of West Hartlepool during the last 12 years. In 1847 only 902 vessels entered the port, while last year the number was 5,175. The quantity of coal shipped in 1847, was 115,912 tons, and in 1859, 843,851 tons. In 1853 the foreign exports of goods (exclusive of coal), were 6,352 tons, and their Customs value, £22,756; last year the exports reached 64,348 tons, and the Customs value, £4,214,783. The import trade was not commenced till 1853, when there were reported:—General cargoes, 8,521 tons; timber, 1,310 tons; and 84,319 qrs. of grain. Last year the quantities were respectively:—General cargoes, 24,748 tons; timber, 56,244 tons; and 164,091 qrs. of grain.

The Pacific Steam Company of Liverpool have had the period of their charter extended to 21 years. The fleet in the Pacific at present consists of nine steamers, and three more are being built to go out. The annual steaming distance of the company along the coasts of New Granada, Ecuador, Peru, Bolivia, and Chili, now amounts to about 170,000 miles, and will be immediately extended to upwards of 300,000 miles. The General Steam Navigation Company have added to their fleet the steamers *Lutcken*, *Saxonia*, *Kielmansegge*, and *Borussie*. The steamers, which formerly belonged to the Harburg Company, average 400 tons each.

The iron shipbuilding trade on the Tyne continues very active. The three leading yards on the shores of that river are extremely busy; two of them are engaged building iron vessels for foreign states, and for the distant colony of Australia. A new line of iron steamers will commence to run between Middlesborough and St. Petersburg shortly.

KENWARD'S BOILER.—An arrangement of a tubular boiler, which has in practice been found to be well adapted for raising steam quickly, has been recently introduced by Mr. Nelson Kenward, of Sutton, in Surrey. Our illustrative engraving represents a vertical longitudinal section of the arrangement. The boiler is of a cylindrical figure in its transverse section. The internal space devoted to the furnace, A, is deeper than usual, the fire bars extending rather more than half-way, a space, B, intervening between the bars and



the fire tubes, C, so as to prevent their being burnt away. At the upper part of the furnace is fitted a series of water tubes. These tubes extend from a projecting water space, F, in front of the boiler over the furnace doors, backwards to the tubular portion. The water tubes are of copper, and arranged in a segmental figure parallel to the shell of the furnace. The fire tubes open into a chamber in the smoke box, D, formed by fitting therein a segmental or horse shoe-shaped water space. The flame and heated products of combustion inpinge upon the internal surface of the water space. The heated gaseous matters pass off at the lower part of the water space in a lateral direction, and upwards over its external surface to the chimney. In supplying this boiler with water, it is pumped in at the lower part of the water space on one side; and after traversing the segmental space, it flows out at the lower part on the other side into the boiler. The supply pipe from the water space is carried forward to the front of the boiler, so that the sediment may be drawn off by means of a cock at front part. In this way the water is heated to the boiling temperature by the escaping products of combustion before it flows into the boiler, so that the heat is economised to the utmost extent. As the furnace occupies a considerable portion of the internal capacity of the boiler, the smaller boiler and steam chest, G, is fitted overhead, as shown in our figure. This portion of the arrangement may, however, be dispensed with in boilers of small size. A four-horse boiler, constructed on this system, is stated to get up steam with remarkable rapidity, and to supply enough for an engine of double the power.

Our Paper Trade.—The quantity of paper of all kinds on which duty was paid during the year 1859 was 217,827,197lbs., and the duty paid was £1,429,490 19s. 8d. Of this quantity 20,142,350lbs. was exported, while the imports were 214lbs. of brown paper, made of old rope or cordage only, paying a duty of £2 4s. 7d.; 211,178 square yards of printed, painted, or stained paper-hangings or flock paper, which contributed £2,564 to the revenue; and 1,586,249lbs. of waste paper and paper not otherwise enumerated or charged with duty, on which £9,981 was paid as duty. Of this latter quality of paper 557,444lbs. was re-exported; 240,052lbs. of paper gilt, stained, coloured, or embossed, and all fancy kinds not being paper-hangings, which paid £2,430 to the Custom-house; giving a total of £14,977 received as duty on foreign paper of all kinds. As compared with the returns of 1834 the total weight of paper, pasteboard, &c., charged with duty in 1859 is nearly trebled, the weight on which duty was paid in 1834 being only 76,138,945lbs., although the amount of duty, in consequence of modifications in the Excise, by no means exhibits a proportionate increase. There is, however, no cause of complaint on this head, as the increase to the revenue by paper duty as compared with 1834 is £595,668 7s. 8d. The experts of paper, pasteboard, &c., show a wonderful increase in the period between 1834 and 1859, being in the latter upwards of four-fifths more than in the former year.

Industry and Invention.—It is a gratifying sign of the continental care for industrial and inventive matters, that a decennial prize of a gold medal and 6,000 francs, commencing from the year 1860, has been founded by the well-known family of Dolfus, at Mulhausen, to be awarded to the best essay during the preceeding ten years, "On the industrial progress of the Upper Rhine District," or to the discoverer of the most useful invention. We hope that this most liberal procceding, liberal, indeed, for any private family, will one day bear good fruit.

Helical Spring Packing Piston.—M. Chammont, an engineer in Paris, has recently patented an excellent arrangement of piston packing on the principle of a metallic helix, which combines the advantages of regular extension both as regards its circumference and length, thereby producing a gentle pressure, and regular and even friction. This helical packing may be constructed of different metals according to the uses to which it is to be applied, and it may be manufactured either by bending or twisting. In the former case the metal is drawn or rolled, and then bent into form; in the latter plan it is first forged and then twisted by a machine. Another excellent characteristic of this packing is its extreme lightness, which is a quality of the greatest importance, especially in horizontal cylinder engines. The elasticity of this packing renders it peculiarly well adapted to stuffing boxes, replacing the old hemp packing, which in locomotive engines becomes rapidly burnt and worn away. This system of packing is capable of any general application by slight modifications, as will be evident on referring to the annexed illustrations.

Fig. 1.

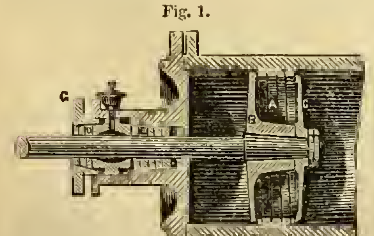
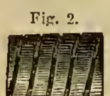
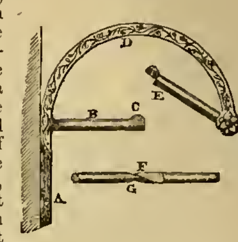


Fig. 1 represents a longitudinal section of a piston and cylinder stuffing box, provided with the improved helical metallic packing; and fig. 2 is a view of the stuffing box packing detached. As will be seen from these figures, the helical packing is composed of a metal bar, A, rolled into a spiral on a mandril. It is enclosed between two cast-iron discs or plates, B C, the one being fitted on to the conical end of the piston rod, and the other held firmly up to the bars of the first disc by two nuts, as shown. Over and above the natural elasticity of this helical packing so constructed, a system of springs similar to those in use in ordinary piston packings may be employed for the purpose of obtaining a further tightness or closeness of contact. In the application of this peculiar system of packing to the stuffing boxes of piston rods, two separate helices, D and E, are employed, and these are made to surround the rod in lieu of hemp or gasket. The two helices are tapered in opposite directions, and are fitted into boxes equally tapered to correspond. An oil box, F, is interposed between the two helices, and is in communication with an oil cup outside, as shown. As the helices are tapered to the right and left of the centre oil box, they are readily tightened, by simply screwing up the external hollow nut or gland, G.

Fig. 2.



Appleton's Letter or Pattern File.—In the accompanying figure we have shown Mr. Appleton's improvement as adapted for filing tailor's patterns, and also for letters and invoices. A metal plate, A, is screwed to the wall, projecting from which in a horizontal direction is a wire arm, B, at the end of which is a knob, C, to prevent the patterns from slipping off. In connection with the plate, A, and extending over the arm, B, is a curved arm, D, which terminates opposite the wire, B. At the end of the arm, D, is attached by a hinge joint a moveable arm, E, the end of which drops down into a slot or groove in the knob, C. So that patterns placed on the part, B, can be slipped on to E, in the same manner that one would remove them from one end of the arm to the other, by which means it is obvious, that patterns, &c., being arranged on B, alphabetically or otherwise, a single pattern may be detached immediately by merely sliding the preceding patterns on the arm, E, raising the same and slipping off the pattern required and returning the others to the arm, B. For invoices or letters the arm, B, terminates in a sharp point, as shown at F, to pierce the paper, the arm, F, is half hollowed out to fit the point of B or F, as shown at G, so as to offer no impediment for the paper passing from B to F. The arm, F, has a spring at the hinge, as it is smaller, and would be often lying on the desk. This very useful contrivance is the invention of Mr. Leonard Appleton, Clarence Road South, Kentish Town.



PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded August 23.

1924. Ashfield C. Hope, 60 Cornhill—The manufacture of a new material from Spanish moss, applicable as a substitute for horse hair.—(Communication from William A. S. Westoby, 45 Rue Taitbout, Paris.)

Recorded September 3.

2012. William Wheatstone, 20 Conduit Street, Hanover Square—Certain improvements in harmoniums.

Recorded September 20.

2138. Alexander Manbre, 10 Rathbone Place, Oxford Street—An improved method of extracting and purifying sugar called glucose and "syrup de fecule" from potatoes, or fecular, or starch, or dextrine.

Recorded October 1.

2228. Alexander S. Stocker, Birmingham—Certain improvements in the manufacture of articles to be affixed to boots and shoes, and to the feet of animals, also applicable to chain links, washers, and other suitable articles, and in the dies to be used therein.

Recorded October 21.

2409. John T. Pitman, 67 Gracechurch Street—A method of clearing the bed of rivers.—(Communication from William Kennish, New York, U. S.)

Recorded October 25.

2434. Hugh Greaves, 5 Victoria Street, Westminster, and West Hartlepool, Durham—Improvements in moulding and casting gas water and other pipes, sash weights and other articles, and in cleaning some of the same from the sand.

Recorded October 28.

2466. Hugh Greaves, 5 Victoria Street, Westminster—Improvements in constructing the permanent way of railways, and in preparing parts thereof to prevent oxidization.

2468. James Higgins, Salford, Lancashire—Improvements in machinery or apparatus for warping yarns or threads.—(Communication from Richard Garsed and Clayton Denn, Philadelphia, U. S.)

Recorded November 3.

2500. George White 34 Dowgate Hill, Cannon Street—A mechanical arrangement for steaming grain or other grits in order to allow the bran better to separate from the flour.—(Communication from Mr. Leon J. E. Dupout, Les Pins, France.)

Recorded November 21.

2637. John T. Pitman, 67 Gracechurch Street—An improved method of curing India-rubber or gutta-percha compounds.—(Communication from Asahel K. Eaton New York, U. S.)

Recorded November 26.

2676. Louis J. Vandecasteele, Bruges, Belgium—An improved method of coupling the locomotive with the tender, for the purpose of giving greater adhesion between the wheels of the former and the rails.

Recorded November 30.

2704. George J. Wainwright, Dukinfield, Chestershire—Improvements in apparatus for supplying moisture to the air in cotton factories, and for indicating and registering the strength and elasticity of yarn and thread.

Recorded December 1.

2715. Achille Mercier, Louviers, Eure, France—A machine for felting the rovings, stubs, and threads or yarns of wool and other fibrous materials.

Recorded December 3.

2746. Charles L. Smith, Highbury Crescent—Improvements in the preparation of certain colouring matters for dyeing, staining, and printing.—(Communication from Albert Schlumberger, Mulhouse, France.)

Recorded December 5.

2750. William Youens, Hackney—Improvements in apparatus for playing keyed musical Instruments.

Recorded December 6.

2756. Edward Dowling, Woodford Bridge, Essex—Improvements in fire escapes.
2762. William E. Newton, 66 Chancery Lane—An improved mode of treating gums, such as India-rubber or gutta percha, for the manufacture of various articles.—(Communication from Rudolph F. H. Havemann, New Brunswick, Middlesex, New Jersey, U.S.)

Recorded December 7.

2766. Robert W. Sievier, F.R.S.—Improvements in the method of, and apparatus for regulating the speed of steam engines connected with the propelling of steam boats or ships.
2774. James Combe, Belfast—Improvements in the mode of, and machinery for hackling, carding, and preparing flax and other fibrous substances, part of which improvements is applicable to transmitting power generally.

Recorded December 8.

2782. John R. Foord, Acorn Wharf, Rochester, Kent—Improvements in applying travellers or lifting engines to barges or other craft, for drawing piles, raising sunken craft, moorings, and other such like purposes.

Recorded December 10.

2803. William Horton, Smethwick, Staffordshire—An improvement or improvements in steam boilers.
2804. Charles Gammon, 9 Cloak Lane—An improved fastener for gloves and other articles.
2805. James Farquhar, Aberdeen, North Britain—Improvements in gas meters.
2806. William Whiteley, Lockwood, near Huddersfield, Yorkshire—Improvements in looms for weaving.
2807. John Chatterton, 19 Wharf Road, City Road—Improvements in the manufacture of projectiles.
2808. Isaac L. Bell, Washington Chemical Works, Newcastle-upon-Tyne—Improvements in the manufacture of the sulphate of magnesia.
2809. John Chatterton, Highbury Terrace, and Willoughby Smith, Pownall Road, Dalston—Improvements in insulating telegraphic conductors, and in the treatment of gutta-percha.
2810. Samuel W. Campain, Deeping, St. Nicholas, Lincolnshire—Improved machinery for removing or elevating straw and other agricultural produce.
2811. William W. Bonnin and Francis Pons, Genoa, Italy—A new system and improvements in locomotive engines.
2812. David Stickland, Hayle, Cornwall—An apparatus for separating, sifting, sorting, and cleansing mineral ores.

Recorded December 12.

2813. Richard Emery, 6 King Street, St. James' Square, Westminster—Improvements in carriages for common roads.
2814. John R. Breckon, Darlington, and Robert Dixon, Crook, Durham—Improvements in the construction of coke ovens.
2815. Prince G. Gennerich, 1B Welbeck Street, Cavendish Square—A new system of motive power, applicable for working cranes and wheels.
2816. Thomas Stather, Kingston-upon-Hull—Improvements in the ventilation of buildings, ships, and other enclosed places.
2817. Patrick Stirling, Kilmarnock, Ayrshire—Improvements in traction engines.
2818. George C. Watson, Chester—Novel and artistic bricks or "lumps" for the reception, growth, and propagation of ferns, mosses, and other plants.
2819. George Lough, Flemington, North Melburn, Victoria, Australia—An improved compound motive engine.
2820. George H. Rollet, Liverpool—An improved machine for the manufacture of pressed bullets.
2821. William Clay, Liverpool—An improved mode of manufacturing cannon and other ordnance.
2822. John R. Isaac, Liverpool—Improvements in the construction of hand-boxes for travellers.
2823. John Bailey, Dunstable—Improvements in the manufacture of corsets and stays.
2824. William Teale, Wakefield, Yorkshire—Improvements in treating fatty and oily matters obtained from wash waters.—(Communication from Mons. Kirsch, Aix la Chapelle, Prussia.)

Recorded December 13.

2825. Caleb Vinall, 25 Walton Street, Brompton—Improvements in, and mechanism for, retaining the rollers of window blinds, maps, charts, and other articles requiring to be wound on rollers.
2826. Theophilus Redwood, 19 Montague Street, Russell Square—Improvements in the manufacture of paper and of substances used in paper making, and for other purposes.
2827. George Withers, West Bromwich, Staffordshire—Certain improvements in blocks for moulding and shaping glass during the process of blowing or forming glass, for blowing sheet glass, glass shades, and such like articles.
2828. John B. Johnson, Hammersmith, and John S. Aitkinson, Red Lion Square—Improvements in machinery for manufacturing printing types.
2829. William Harding, Rutland Terrace, Forest Hill, Kent—Improvements in breech-loading fire-arms and in cartridge carriers.
2830. John Barling, Belle Grange, Lancashire—Improvements in propelling vessels.
2831. William Robinson, Wembdow, Bridgewater, Somersetshire—Improvements in cask washing machines.
2832. Samuel C. Lister, Manningham, and James Warburton, Addingham—Improvements in machinery for preparing and combing wool, flax, silk, and other fibrous materials.
2833. James H. Dickson, Commercial Street, Rotherhithe, Surrey—Improvements in the manufacture of yarns and in the machinery to be employed in the preparation of certain fibres to be thus manufactured into yarns.

Recorded December 14.

2834. William Hulse, Birmingham—Improvements in the manufacture and ornamentation of metallic bedsteads and other articles of like manufacture, and in apparatus and machinery employed therein.
2835. William Clark, 53 Chancery Lane—A heating apparatus for boots and shoes and other coverings for the feet.—(Communication from Messrs. Bihet, Leger, and Faury, 29 Boulevart St. Martin, Paris.)
2836. Thomas Bolton, John Bertenshaw, and James McConnell, Bolton-le-Moors, Lancashire—Certain improvements in machinery or apparatus for roving, slubbing, spinning, and doubling cotton and other fibrous materials.
2837. James Champion, Manchester—Certain improved arrangements of spindles, flyers, and bobbins, applicable to machinery or apparatus for preparing, spinning, and doubling fibrous materials.
2838. George Bedson, Manchester—Improvements in puddling furnaces.
2839. George Leach, Britannia Mills, Leeds, Yorkshire—An improved mode of and apparatus for oiling, preparing, and mixing wool.
2840. Samuel Bentley, and John Stringer, Wednesbury, Staffordshire—Certain improvements in railway chairs.
2841. Ramsey Lawson, Manchester—Certain improvements in machinery or apparatus for punching patterns or devices upon metallic printing rollers or cylinders.
2842. Andrew Leslie, Hebburn Quay, Gateshead, Durham—Improvements in the construction of iron ships or vessels, and for strengthening the same.
2843. Joseph Rhodes, Wakefield, Yorkshire—Improvements in steam hammers.
2844. Alfred B. Ibbotson, Sheffield, Yorkshire—An improved draw and buffer spring apparatus for railway carriages.—(Communication from John Parker, Florence.)
2845. William Watson, Leeds, Yorkshire—An improvement in preparing indigo for dyeing and other purposes.
2846. George Hawksley, Three Mill Lane, Bromley-by-Bow—Improvements in pumps.
2847. William R. Crocker, Northumberland Street, Strand—Improvements in cutting corks and bungs, and in apparatus employed therein.
2848. George Leslie, Mall, Hammersmith—Improvements in preserving casks by means of self-acting apparatus for closing up the holes made in casks, and excluding air from such casks when in an empty state.

Recorded December 15.

2849. William C. Wilkins, Long Acre—Improvements in lamps for lighthouse purposes.
2850. Francis J. Bettles, Kingsland—Improvements in apparatus for propelling vessels.
2851. Bartolommeo Predavalle, Bloomsbury Street, Bloomsbury Square—Improvements in producing or obtaining motive power.
2852. Charles Reeves, Birmingham, Warwickshire—An improvement or improvements in breech loading fire arms.
2853. William Westwood, 43 West Square, Southwark, Surrey—Improvements in the manufacture and burning of Portland cement.
2854. Edouard Cormier, Paris, France—Improvements in the preservation of eggs.
2855. James K. Hardy, Fenchurch Street—Improvements in the manufacture of bottle stands.
2856. Henry Martin, Stockton-on-Tees, Durham—Improvements in pumps and beer engines.
2857. Charles Hancock, West Street, West Smithfield—Improvements in insulating telegraphic conductors, and manufacturing cables for telegraphic purposes.
2858. William Gadd, Langsyne Terrace, Nottingham—The manufacture of edgings and quillings made simultaneously on lace or warp lace machinery.
2859. Daniel J. Fleetwood, Birmingham—Improvements in machinery for raising and stamping metal.
2860. William H. Harfield, Royal Exchange Buildings—Improvements in windlasses, capstans, and shackles for chains.

Recorded December 16.

2861. John L. King, 56 Well Street, Oxford Street—A submarine lamp and safety lamp for mines and other useful purposes.
2862. Edward P. Holden, Bolton-le-Moors, Lancashire—Improvements in machinery for opening, carding, and cleaning cotton and other fibrous materials, when in a manufactured or partially manufactured state.
2863. William Mosley, jun., Salford, Lancaster—Certain improved machinery or apparatus for washing, scouring, or cleansing textile fabrics or materials.
2864. John Knight and Alder Walbank, Great Horton, and Joseph Bentham, Bradford, Yorkshire—A new woven fabric and in the materials employed in its manufacture.
2865. Joseph J. Bennett, Homer Terrace, Victoria Park—An improved construction of fluid meter.
2866 Henry Stokes, 27 Coventry Street—Improvements in boots, particularly applicable for military purposes.
2867. Robert Morrison, Newcastle-upon-Tyne—Improvements in double and single action steam hammers.

Recorded December 17.

2868. Brymore E. Pym, King William Street—An improved cinder shovel or cinder sifter.
2869. Friedrich Hochstaetter and Heinrich Hochstaetter, Gresham Street—The preparation of a substitute for gunpowder.
2870. John Sellers, Manchester—Improvements in the manufacture of size for stiffening, finishing, and dressing woven fabrics and yarns.
2871. Frank C. Hills, Deptford, Kent—Improvements in means and apparatus for purifying gas, and in the preparation and treatment of oxides of iron to be used in such purification, or for other purposes.
2872. Robert W. Savage, 15 St. James Square, Westminster—Improvements in fire escapes, also applicable to ladders, portable scaffolding, and such like purposes.
2873. Thaddeus Fairbanks, St. Johnsbury, Caledonia, Vermont, U.S.—An improved scale for weighing letters.
2874. Thomas W. Plum, Blaenavon Iron Works, Monmouthshire—Improvements in the manufacture of tyres for railway and other carriage wheels, and of hoops and rings, and in machinery employed therein.
2875. Matthew Wright, 17 Gracechurch Street—Fastening packing cases by which they cannot be opened without such opening being detected.
2876. Robert P. Busk, Lillie, France, and Thomas Greenwood, Leeds, Yorkshire—Improved machinery for opening and drawing fibrous substances.
2877. Peter Spence, Pendleton, Lancaster—Improvements in repairing bells injured by cracks or fractures.
2878. Joachim D. Hinsch St. Paul's Churchyard—Improvements in the construction of gun boats.
2879. William Clark, 53 Chancery Lane—Improvements in the supports or chairs of railway rails.—(Communication from Auguste Desgoffe and Leon Jucqueau, Paris.)

Recorded December 19.

2880. Matthew Todd, Bradford, Yorkshire—Improvements in machinery for combing wool or other fibrous substances
2881. Edward T. Hughes, 123 Chancery Lane—Improvements in apparatus for cutting out the soles and counters of boots and shoes.—(Communication from Monsieur L. Letournel, Rue de Lyon, Paris.)
2882. Edward B. Wilson, and Robert S. North, Rotherham, Yorkshire—Improvements in the manufacture of cranked axles, and also of tyres for railway and other wheels, and in the machinery or apparatus employed therein.
2883. George S. Goodall, Brighouse, Yorkshire—Improvements in wire card-covering, for carding tow, flax, or other fibrous substances.
2884. Louis Serbat, St. Saulve, France—Improved means of removing incrustations in boilers, and of preventing the same.
2885. Andrew Bathgate and John H. Wilson, Liverpool—Improved apparatus for distilling water, and cooking on board ship.
2886. Louis Pellissier, Jules Jannesse, and Edouard Castillon, Bordeaux, France—An improved brake for railway carriages, and mode of transmitting signals for working the same.
2887. George Davies, 1 Serle Street, Lincoln's Inn, and 28 St. Enoch Square, Glasgow—Improvements in musical instruments with piston or cylinder valves, and in the

method of writing or arranging music for the same.—(Communication from Gustave A. Besson, Paris.)
2888. Thomas Symons, Plymouth, Devonshire—Improvements in propelling vessels through water.
2889. John Cowan and Phineas Cowan, Barnes, Surrey—Improvements in revivifying or restoring animal charcoal and in the apparatus employed therein.
2890. David Hitchin, Coventry, Warwickshire—An improvement in the caps of watches.
2891. John Smith, Birmingham, Warwickshire—Improvements in the manufacture of composition jewellery and ornaments, and in cases for jewellery, photographs, and for other similar purposes.

Recorded December 20.

2893. Matthew Jones, Cardiff, Glamorganshire—Improvements in the mode of preventing explosions in boilers and steam generators.
2894. John Stonyer and John Whitmee, Ray Street, Clerkenwell—Improvements in fluid meters, such improved meters being applicable to purposes in addition to the ordinary purposes of fluid meters.
2895. Michael Turner, Birmingham, Warwickshire—A new or improved method of manufacturing metal boxes.
2896. Joseph Willcock, 89 Chancery Lane—A new and improved machine for cutting or mincing meat, vegetables, &c.—(Communication from Albert W. Hale, New Britain, Connecticut, U.S.
2897. William Bayley, jun., 79 White Lion Street—Improvements in machinery for cutting wood.
2898. George Collier and John Collier, Halifax, Yorkshire—Improvements in means or apparatus for the manufacture of carpets and other pile fabrics.
2899. James Fenton, Low Moor, near Bradford, Yorkshire—Improvements in cannon and other fire-arms, and in projectiles.
2900. William Henderson, Alderley Edge, Chester—Improvements in treating certain ores and alloys, and in obtaining products therefrom.
2901. Richard S. Howden and Edwin Thresh, Wakefield, Yorkshire—An improved construction of safety lamp.
2902. Alfred V. Newton, 66 Chancery Lane—An improved construction of churn.—(Communication from John Booth, Buffalo, New York.)
2903. Alfred Welch, Southall—Improvements in portable railways to facilitate the movement of carriages on common roads and other surfaces.—(Communication from James Welch, Calcutta.)
2904. James Ferrabee, Stroud, Gloucestershire—Improvements in screw wrenches or spanners, and in securing the cotters of connecting rod and other bearings.
2905. Henry Bayley, Stalybridge, Lancashire—Improvements in the construction and manufacture of cop tubes used in machinery for spinning fibrous materials.
2906. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the manufacture of "water traps," and in the apparatus employed therein.—(Communication from James A. Lowe, New York.)
2907. Perry G. Gardiner, New York—Springs for carriages or railroad cars.
2908. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in churns.—(Communication from Silvanus S. Riker, Payton Spence, Isaac W. Morrell, and Leonardo Westbrook, New York, U.S.)

Recorded December 21.

2909. Samuel Plimsoll, Hatton Garden—Facilitating the unloading and transferring from railway waggons into carts and barges, &c., the coals and other matters with which they may be loaded, and for storing the same.
2910. William Demsey, Buglawton, near Congleton, Chester—An apparatus to fold bindings of any description.
2911. Alfred V. Newton, 66 Chancery Lane—Improved machinery for cutting and dressing stone.—(Communication from Jean P. Kehr and Jean Millet, Paris.)
2912. William Abbot, 118 Cambridge Street, Warwick Square—An improved method of preserving timber, particularly adapted for railway purposes.—(Communication from James C. F. Calvert, Dardanelles, Turkey.)
2913. William Abbott, 118 Cambridge Street, Warwick Square—An improved method of rendering fire-wood inflammable.—(Communication from James C. F. Calvert, Dardanelles, Turkey.)
2914. John Glasson, Newark-upon-Trent, Nottinghamshire—Improvements in steam engines.

Recorded December 22.

2915. Louis B. Ollivier, Bron, France—Improvements in ploughshares, hoes, and other similar cutting parts of agricultural implements.
2916. William E. Gedge, 4 Wellington Street, South Strand—Improvements in the manufacture of artificial feathers.—(Communication from Jean U. Wild, Nancy, France.)
2917. William E. Newton, 66 Chancery Lane—An improved process and apparatus for extracting or separating paraffine from schistose or mineral oils and other hydrocarbons.—(Cmmunication from Paul F. Morin, Paris.)
2918. Alfred V. Newton, 66 Chancery Lane—An improved construction of kiln or oven, for burning bricks, tiles, limestone, and other substances.—(Communication from Frederich Hoffman, Berlin, and Albert Licht, Danzig, Prussia.)
2919. Thomas Allen, Wain Gate, Sheffield, Yorkshire—Improved machinery for cutting out clothing and every description of textile fabrics.
2920. George F. Stidolph, Ipswich—Improvements in organs and other wind musical instruments.
2921. Benjamin Fleet and Joseph Rawlings, East Lane, and Thomas Cloake, 6 Saville Row, Walworth, Surrey—Improvements in machinery for stopping the bodies and wheels of railway and other carriages, and which machinery is an improvement on the machinery already patented by letters patent granted to Thomas Cloake, dated the 1st March, 1859.

Recorded December 23.

2922. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—Improvements in voltaic batteries.—(Communication from Hippolyte F. P. Benoist, Paris.)
2923. Frederick A. Abel, Woolwich Royal Arsenal—Improvements in protecting from fire textile materials in the raw or in the manufactured state.
2924. John Hyde and John H. Hooper, Christ's Church, Surrey—Improvements in propellers of steam vessels on canals.
2925. William E. Gedge, 4 Wellington Street South, Strand—An improved box or case for packing sardines or other provisions.—(Communication from Etienne Chatonet, jun., La Rochelle, France.)
2926. Edward Ecroyd, Limefield, Little Marsden, John Dodgeon, Burnley, and Jonathan Heyworth, Little Marsden, Lancashire—Improvements in looms.
2927. Henry Penny, Finchley Road, St. John's Wood—Improvements in the treatment of vegetable fibres for the manufacture of paper.
2928. William Laird, Birkenhead, Chester—Improvements in floating batteries.
2929. Richard Telford, Birmingham, Warwickshire—Improvements in castors.
2930. Robert D. Guthrie, Leadenhall Street—An improved method of lowering ships' boats.
2931. Richard A. Brooman, 166 Fleet Street—Improvements in hot water heating apparatus.—(Communication from Lewis Cross, Rotterdam.)
2932. John Giles, Cannon Street—Improvements in locomotive traction engines
2933. Thomas Aveling, Rochester, Kent—Certain improvements in locomotive engines, parts of which improvements are applicable to the transmission of motive power.
2934. Jose J. de Arrieta, Piccadilly, and Jean P. Lamar, Bush Lane—Improvements in bleaching, cleansing, and decolorising, and in apparatus employed therein.—(Communication from Daniel H. Guillaume, Courbevoie, France.)

Recorded December 24.

2935. George K. Geyelin, 462 Oxford Street—Making transparent metallic twisted columns pillars, tubes, &c., for bedsteads, gasaliers, building, warming, and other purposes.
2936. Daniel Hulett, 55 and 56 High Holborn, and Gottlier Boccius, Totnes, Devonshire—Improvements in cannon and fire-arms, and in percussion cap-holders and chargers.
2937. William Sander, New Basford, Nottinghamshire—Improvements in machinery for embossing lace or other textile fabrics made on bobbin net machines.
2938. Robert Gardiner Hill, Inverness Lodge, Brentford—An improved fire escape.
2939. Emilie Huber, Paris—The preparation of certain colouring substances for printing and dyeing, or other purposes.
2940. Henry B. Barlow, Manchester—Improvements in screw cutting machines.—(Communication from Joseph P. Haigh, Pittsburg, Pensylvania, U.S.)
2941. Edwin Smith, Marble Works, Sheffield, Yorkshire—Improvements in ornamenting metal pipes or tubes.
2942. George G. Brown, Deptford, Kent, and John W. D. Brown, Greenwich, Kent—Improvements in oil lamps.
2943. Francis G. Spillsbury, Bow—A certain translucent or transparent fabric, and for certain applications of the same to various purposes.
2945. Robert M. McTurk and George East, Liverpool—Improvements in the manufacture of collars and cuffs.—(Communication from Andrew Smith, New York.)
2946. William E. Newton, 66 Chancery Lane—Improvements in mills for grinding.—(Commuuication from Mr. Cahanes, Paris.)
2947. John Smith, Birmingham, Warwickshire—Improvements in the manufacture of buttons and other dress fastenings.

Recorded December 27.

2948. William Hudson, and Christopher Catlow, Burnley, Lancashire—Certain improvements in looms for weaving.
2949. Frederick Levick, Blaina Cwm Celyn and Coalbrook Vale Iron Works, Monmouthshire—Improvements in puddling and other reverbatory furnaces used in the manufacture and heating of iron, and for other like purposes, in economising the waste heat of the said furnaces.
2950. Thomas S. Truss, 53 Gracechurch Street—Improvements in the mode of packing or cushioning railway chairs, pillars, pipes, girders, and engines, by the use of animal and vegetable fibre-packing chemically prepared.
2951. William E. Tayler, 4 Russell Place, Montpelier, Bristol—Fastening the hairs in tooth brushes and other brushes.
2952. John J. House and Henry A. Martin, 1 Watson Walk, Sheffield, Yorkshire—An improved method of application and arrangement of indexes to account and other books.
2953. Xavier C. de Nabat and Armand C. de Nabat, 41 Rue d'Angouleme St. Honore, Paris—An apparatus to shear domestic animals.
2954. William B. Johnson, Manchester—Improvements in steam engines and boilers, and apparatus connected therewith.
2955. William Maryon, 9 Stanhope Street, Hampstead Road—Improvements in ladders and in machinery to be used in making them.

Recorded December 28.

2956. Lazarus S. Magnus, 3 Adelaide Place, London Bridge, and William Sinnock, Brompton, Kent—Improvements in preparing yarn, twine, cords, and strands, and other fibrous materials, to render the same more suitable for submarine telegraph cables and other uses.
2957. Alfred V. Newton, 66 Chancery Lane—An improvement in the treatment of stricks or bundles of fibres, and the conversion of the same into slivers or ribbons.—(Communication from Charles de Jongh, Guebwiller, France.)
2958. Alexander M'Dougall, Manchester—Improvements in the preparation of disinfecting and antiseptic substances.
2959. Cornelius J. Rooney and David Renshaw, New York—An improvement in spring door hinges.
2960. Frederick Dressler, Nasseau Street—Improvements in dining and other tables, which improvements are applicable to other articles of furnitnre.
2961. Francois P. Tanniard, Beaume, France—An apparatus indicating the time in music, and which can serve as a diapason.
2962. Charles S. Rostaing, Dresden, Saxony—Improvements in combining and mixing gutta percha with mineral and vegetable substances, capable of altering its quality in such a manner as to produce hard, resistant, unalterable and imputrescible compounds diversely coloured.
2963. William A. Gilher, 4 South Street, Finsbury—A new manufacture of colouring matter for replacing lokas or Chinese green. — (Commuuication from Felix Charvin, Lyons.)
2964. Jules Englemann, Mulhonse, France—Improvements in steam engines.
2965. Arthur J. Melhuish, Bowater Place, Blackheath—Improvements in cameras.
2966. George T. Peppe, Peak Hill, Sydenham—Improvements in apparatus for keeping time.

Recorded December 29.

2967. Samuel King, Edward Street, Portman Square—Improvements in spirit lamps.
2968. Edward Kirby, Lower Moor, Oldham, Lancashire—Certain improvements in, or applicable to machines for spinning, doubling, winding, reeling, and weaving, and in cop tubes used in such machines.
2969. James S. Crossland, Johnsonbrook, near Hyde, Chester—Certain improvements in steam engines and boilers, and in the mode of applying steam engines.
2970. Alfred V. Newton, 66 Chancery Lane—Improvements in the mode of, and apparatus for, submitting yarns or threads to the action of gaseous and liquid bodies.—(Communication from Charles de Jongh, Guebwiller, France.)
2971. Henry B. Barlow, Manchester—Improvements in machinery or apparatus for stripping or cleaning the drums and rollers of carding engines and other machines in which rollers covered with card teeth are employed.—(Communication from H. Rieter, Winterthur, Switzerland.)
2972. Thomas Fearuley, Bradford, Yorkshire—Improvements in steam hammers.
2973. Thomas R. Russell, Liverpool—The application of certain metals or materials to the manufacture of the movements of watches and other time-keepers.
2974. Thomas Thomas, Rawtenstall, Lancashire — Improvements in machinery or apparatus for spinning fibrous materials.
2975. Thomas S. Cressey, Burton-on-Trent—Improvements in trussing casks, and in apparatus employed therein.
2976. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in sewing machines.—(Communication from James S. Goodridge Grenoble, France.)
2977. Joseph Cliff, Wortley, near Leeds, Yorkshire—An improvement in cleansing wool, and woollen waste.

2978. William E. Newton, 66 Chancery Lane—Improvements in machine belting for banding, and in the machinery and process of making the same.—(Communication from John H. Cheever, New York, U.S.)
2979. Joseph Cliff, Wortley, near Leeds, Yorkshire—An improvement in the manufacture of clay retorts.
2980. Sir Robert Fairbairn, and Robert Newton, Leeds, Yorkshire—Improved machinery for combing silk, flax, and other fibres.

Recorded December 30.

2981. William Smith, Kilmarnock, Ayrshire—Improvements in the manufacture of fireclay gas retorts.
2982. William Smith, Kilmarnock, Ayrshire—Improvements in stack-pillars, or supports for stacks and ricks of agricultural produce.
2983. Thomas Anchincloss, Glasgow—Improvements in machinery or apparatus for beetling and washing textile fabrics.
2984. William Smith, Kilmarnock, Ayrshire—Improvements in vent or chimney linings, and in smoke preventive and ventilating apparatus connected therewith.
2985. Thomas L. Ball, New York City, U.S.—Improvement in show cases for the containing of fancy articles.
2986. Reuben Jones, Trinity Terrace, Trinity Square, Southwark, and Daniel Stothard, Newington, Surrey—Improved mechanical arrangements for raising, lowering, and disengaging ships, boats, and other ponderous bodies.
2987. William Robertson, Manchester—A new mode of dragging boats by the power of the water passed through canals or rivers, or otherwise attainable.
2988. William E. Gedge, 4 Wellington Street South, Strand—An improved tooth brush.—(Communication from Earnest Poussart, Amicout, France.)
2989. William E. Gedge, 4 Wellington Street, Strand—A new system of paddles for steam boats or other vessels.—(Communication from Guillaume Cusset, Givors, France.)
2990. Joseph Whitworth, Manchester—Improvements in projectiles and machinery for their manufacture.
2991. James Slack, Hyson Green, Terrace Street, Nottingham—Improvements in water and steam gauges for steam boilers.
2992. Henry Cochrane, Midlesbro'-on-Tees—Improvements in the construction of core bars.
2993. William E. Newton, 66 Chancery Lane—Improvements in spinning machinery.—(Communication from Eugene Angustin, Lecœur, Paris.)

Recorded December 31.

2994. James Braggins, Banbury, Oxford—Improvements in gates for fields and carriage roads.
2995. Thomas C. Gregory, Glasgow—Improvements in railway carriages.
2996. Robert Gibson, Lincoln—Improvements in the permanent way of railways, and in the manufacture of parts of the same.
2997. Henry Munster, Brighton, Sussex—Certain improvements in billiard and other tables.
2998. William Jackson, 4 Spring Terrace, York Road, Lambeth, Surrey—Improvements in sewing or stitching machines.
2999. James Ridsdale, Stoke Newington Green—Improvements in the construction of syphons.
3000. John Eason, Oxford Street—Improvements in tanning and in the manufacture of leather, and in machinery adapted thereto.

Recorded January 2, 1860.

1. Joze Luis, 1b Welbeck Street, Cavendish Square—An improved brick-making machine.—(Communication from Joseph Tenand, Paris.)
2. Joze Luis, 1a Welbeck Street, Cavendish Square—An improved safety lock.—(Communication from Lasserre and Sarthon, Paris.)
3. William Simons, Glasgow—Improvements in the construction of ships or other floating vessels.
4. Henry A. Dewar, Union Street, Aberdeen—Improvements in moulding or applying India-rubber as the basis of artificial teeth, and in apparatus for the same.
5. William Jackson, Worsley, Lancaster—Improvements in coupling apparatus for hoists for the prevention of overwinding.
6. Alexander Prince, 4 Trafalgar Square—Improvements in the construction of pianofortes.—(Communication from Dr. Hurlimann, Zurich, Switzerland.)
7. Samuel Rowbotham, Putney, Surrey, and Thomas Gratton, Derby—A composition for rendering uninflammable linen, cotton, silk, or other inflammable fabrics and substances.

Recorded January 3.

8. Thomas Hardy, Windmill Street, Wednesbury, Staffordshire—An improved tool for cleaning the inside of the tubes or flues of tubular steam boilers.
9. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in furnaces and fire-places for the better combustion of fuel.—(Communication from Nicholas F. C. Desboissieres, Paris.)
10. John Horridge, Birkenhead, Chester—An improved iron wheelway for streets and roads.
11. Louis B. Ollivier, 29 Boulevart St. Martin, Paris—Improvements in ploughs.
12. Ephraim Chetwyn, Worcester—Improvements in the manufacture of gloves.
13. David Hulett, 55 and 56 High Holborn—Improvements in apparatus for indicating the pressure of gas.
14. Daniel Bateman and Samuel Bateman, Low Moor, Bradford, Yorkshire—Improvements in machinery for the manufacture of cards for carding wool, and other fibrous substances.
15. Frederic Hudson, 227 Blackfriars Road, Surrey—Improvements in gas meters.
16. Alfred V. Newton, 66 Chancery Lane—Improvements in the cut off motion and slide valves of steam engines.—(Communication from Charles A. Schultz, and John Hanck, New York, U.S.)
17. John Wheatman, Sheffield, Yorkshire—Improvements in machinery or apparatus for grinding saws and other similar articles of metal.

Recorded January 4.

18. Mathieu Blacet, St. Etienne, France—Improvements in miners' safety lamps.
19. Philippe Grimaldi, 60 Boulevart de Strasbourg, Paris—Improved steam generators not liable to bursting.
20. Joseph L. E. Klein, and Jules P. Roger, Montmartre, France—A rotatory vice applicable for the manufacture of shoes and all objects of art or industry generally made by hand.
21. George Davis, 1 Serle Street, Lincoln's Inn, and 28 St. Enoch Square, Glasgow—Improvements applicable to nibs or burners for gas.—(Communication from Mons. Legris, Paris.)
22. Edmund Thomas, St. Mellons, Monmouth—A self-acting water gauge for steam boilers with a regulator for the feed.
23. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved fertilising compound for agricultural purposes.—(Communication from Charles de Chauveau and Celeste Duval, Oran, Algeria.)

24. Marc A. F. Mennons, 39 Rue de l'Echiqnier, Paris—Certain improvements in the production of motive power, and in the apparatus connected therewith.—(Communication from Louis D. Laserson, Paris.)
25. Joseph Walls, Farington Mills, near Preston, Lancaster—Improved arrangements of compound steam engines.
26. Philip J. Worsley, Rotherhithe, Surrey—Improvements in the separation of silver and lead.
27. Charles Gammon, 9 Cloak Lane—An improved churn.
28. Albert Horwood, Great Quebec Street—Improvements in signalling by electricity, and in apparatus connected therewith, adapted to communicating between railway stations and railway trains, and also applicable to other purposes.

Recorded January 5.

29. Louis A. le B. de St. Just, 1b Welbeck Street, Cavendish Square—An improved machine for cutting soft and hard stones in open quarries.
30. Alfred V. Newton, 66 Chancery Lane—An improved mode of and apparatus for fitting the abutting ends of the rails of railways together.—(Communication from Benjamin A. Mason, Newport, Rhode Island)
31. Austin Chambers, Bow—Improvements in the mode of working junction signals on railways.
32. George Sample, Montague Place, Whitechapel—Improvements in boots, shoes, clogs, and such like coverings for the feet.
33. Samuel Perkes, Clapham, Surrey—Improvements in presses and modes of pressing, applicable to cotton, hemp, wool, coir, hides, hay, fibres, peat, linen, thread, piece goods, extracting oil, and other useful purposes.
34. John Fisher, Carrington, Nottingham—Improvements in machinery or apparatus for washing, cleansing, or purifying clothes and other articles.
35. Thomas Procter and Thomas Walker, Derby—Improvements in sewing machines.
36. Richard A. Robinson, 25 Canon Street, E.C.—Improvements in sugar mills.
37. Otto J. T. Gossell, Moorgate Street—Improvements in the construction of locomotive engines.—(Communication from Louis Stossger, Breslau, Prussia.)

Recorded January 6.

38. Vital de Tivoli, 67 Lower Thames Street, and Col. Joseph Hudson, 13 Victoria Street—A swimming and floating apparatus.
39. John Knowles, Lower Broughton, near Manchester—Certain improvements in looms for weaving.
40. Henry C. Hill, Stalybridge, Chester—Certain improvements in, or applicable to, machines for carding cotton, flax, wool, and other fibrous materials.
41. Rene C. Videgrain, 10 Laffitte Street, France—Improvements in the manufacture of artificial marbles.
42. Thomas Moy, 1 Clifford's Inn—Improvements in steam engine governors.
43. John Fowler, Waterford—Improvements in locks for doors and other purposes.—(Communication from Warren Rowell, New York, U S.)
44. Louis F. Perrier, Marseilles, France—Improvements in machinery for making wax matches, and in wood matches.
45. Roger Vivian, Tucking Mill, Cornwall—Improvements in constructing balls for cricket and other games, which invention is also applicable to spherical valves.
46. Edward J. Harland, Belfast—Improvements in constructing and covering the decks of ships and other floating bodies.
47. William Hooper, Mitcham, Surrey—Improvements in re-working compounds of India-rubber and sulphur, and in insulating telegraphic wires or conductors.

Recorded January 7.

48. Thomas Bellamy, Birmingham—An improvement or improvements in the manufacture of wire lattice-work.
49. James B. d'A. Boulton, Usk, Monmouthshire—Improvements in slide valves.
50. John Hawkins, Lysle Street, and Charles Hawkins, Walsall, Staffordshire—An improved apparatus for the use of railway guards and passengers, for the purpose of communicating with the engine drivers of railway trains when necessary.
51. Benjamin Bayliss, Aston Park, Warwickshire—Improvements in breech-loading fire-arms, applicable for military and sporting purposes.
52. John Garnet, Windermere, Westmoreland—Improvements in writing desks and in apparatus connected therewith.
53. Richard Moreland, jun., 5 Old Street, E.C.—Improvements in condensing apparatus, to be used with high pressure steam engines.
54. Henry Chance, Birmingham, Warwickshire, and Thomas Howell, Smethwick, Staffordshire—Improvements in the manufacture of glass.
55. Joseph W. Wilson, 9 Buckingham Street, Strand—Improvements in apparatus for cleaning guns.

Recorded January 9

56. Jules F. Hillel, 1b Welbeck Street, Cavendish Square—An improved machine for squatting, separating, and tearing rushes, and all other textile fibrous plants.
57. George Beningfield, Clark Street, Stepney—Improvements in reservoir or fountain pens.
58. Pierre Czugajewicz, Paris—Certain improvements in stereoscopes.
59. Robert Mathers, 287 Oxford Street—Improvements in the manufacture of wheels and axles.
60. John A. Coffey, Providence Row, Finsbury—Improvements in obtaining and applying motive power by means of ponderous bodies.

Recorded January 10.

61. William H. Thornthwaite, Newgate Street—Improvements in the treatment and reduction of ores, and in the manufacture of iron and steel, and in the construction and mode of working the furnaces employed in such said manufacture.
62. William H. Morrison and Henry Kinsey, Nottingham—Improvements in means or apparatus employed in the manufacture of bonnet and cap fronts, rouches and other articles of millinery, parts of which improvements are also applicable in the treatment of lace for other purposes.
63. Samuel Isaac, St. James' Street—Improvements in overcoats, particularly adapted to military purposes.
64. Maurice Vergnes, New York, U. S.—Improvements in galvanic batteries.
65. John F. Dickson, 6 Russell Street, Litchurch, near Derby—Improvements in the construction of sewing machines, together with the apparatus connected therewith.
66. William A. Henry, Sheffield, Yorkshire—Improvements in machinery or apparatus for the manufacture of screws.
67. William T. B. Allday, Rednal, Worcester—Certain improved apparatus for separating filings, or other small bits or particles of iron or steel, from other metallic filings, scrapings, chippings, or other small particles or dust.

Recorded January 11.

68. Alfred S. Bolton, Okamoore, Staffordshire, and Francis F. Bolton, Birmingham, Warwickshire—An improvement or improvements in the manufacture of hollow cylinders of copper or alloys of copper, which said cylinders may be used for rollers for printing fabrics, and for such other purposes as the same are or may be applicable to.

69. Cecil Johnson, 6 Northumberland Street, Strand—Making a shoe without the use of leather.
70. William Cotton, Loughborough, Leicester—Improvements in machinery or apparatus employed in the manufacture of looped fabrics.
71. Adolph Strauss, Spittlefields—An improvement in pipes for smoking.
72. John Jamieson, 10 Catherine Terrace, Gateshead—Improvements in compressing and expanding æriform fluids.
73. Archibald Brownlie, Glasgow—Improvements in the treatment of sewerage matters and in the apparatus employed therein.
74. Andrew Reid, Londonderry—Improvements in shirts.
75. William E. Newton, 66 Chancery Lane—Improved apparatus for transmitting signals.—(Communication from Mark Runkel, New York, U.S.)
76. O'Donnell Grimshaw, Belfast—Improved apparatus for registering the number of impressions given to documents or other articles by hand stamps and stamping or printing presses.
77. William E. Newton, 66 Chancery Lane—Improved apparatus for moulding candles.—(Communication from Henry Ryder and Horatio Leonard, New Medford, Middlesex Massachusetts, U.S.)
78. Alfred V. Newton, 66 Chancery Lane—An improved construction of lock.—(Communication from John Lord and Richard Batchelder, Manchester, New York, U. S.)
79. Charles T. Boutet, 176 Tottenham Court Road—A new mover applicable to all branches of industry, and designed to replace the steam, the Aero-hydraulic-mover.

Recorded January 12.

80. Andrew West and John Robinson, Wickham Market, Suffolk—Improvements in furnaces and in apparatus to be used therein.
81. William H. Orchard, 15 Hatton Garden—Improvements in dressing millstones for cleaning all kinds of small grain having a husk or hull.—(Communication from Henry Darling, New York, U. S.)
82. Charles de Bergue, Dowgate Hill—Improvements in machinery for riveting, parts of which are applicable to machines for punching metal.
83. Eugene Ferrier, 22 Boulevard Montmartre, Paris—A new clock.
84. William Sinnock, Brompton, Kent—Improvements in the arrangement of apparatus for the manufacture of hempen or other fibrous covered insulated wires for submarine telegraph cables.
86. William Sinnock, Brompton, Kent—An improved apparatus for paying out submarine telegraph cables.
86. George Carter, Water Street, Blackburn, Lancashire—Improvements in the means and apparatus for boiling and mixing size, colour, or any other matter or substances requiring such treatment.
87. Sidney Frankau, Bishopsgate Street—An improvement in pipes for smoking.
88. George Robinson, Newcastle-upon-Tyne—Improvements in the manufacture of carbonate of lead and of chlorine.
89. Robert Burley, Glasgow—Improvements in handles for hammers, mallets, picks, and similar tools.
90. Alfred C. Twentyman, Wolverhampton, Staffordshire—Improvements in machinery to be used in manufacturing spikes, bolts, rivets, screw-blanks, and other similar articles.—(Communication from James H. Shweet, Pittsburg, Pennsylvania, U. S.)
91. Paul Moore and Paul Moore, the younger, Birmingham, Warwickshire—Improvements in the manufacture of the dies or draw-plates used in drawing wire and tubes, and for other similar purposes.

Recorded January 13.

92. Edwin Harrison and Joshua Scott, Oldham, Lancashire—Improvements in gas meters.
93. Frederick N. Gisborne, Sydenham, Kent—Improvements in insulating material for telegraphic purposes.
94. Aurelius B. Mitchell, Birmingham, Warwickshire—Improvement or improvements in ornamenting brass knobs for doors, drawers, cupboards, and for other like purposes.
95. Joseph Hayes, Gloucester—Improved break for common road and railway carriage wheels, applicable also to the wheels of machinery for raising and lowering weights.
96. Joseph Goddard, Stockport, Cheshire—Improvements in the preparation and dyeing of yarns or threads.
97. John Musselwhite, Devizes, Wiltshire—Improvements in apparatus for transferring fluids.
98. John Eunson, Wolverhampton, Staffordshire—Improvements in refrigerating apparatus.—(Communication from Robert G. Eunson, New York, U. S.)

Recorded January 14.

99. William Knowles, Bolton-le-Moors, Lancashire—Certain improvements in machinery for carding cotton and other fibrous materials.
100. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved candle-wick.—(Communication from Lepold Autran, Milan, Piedmont.)
101. Benoit Lang, 67 St. Martin's Lane, Westminster—An improved method or apparatus for obtaining a continuous stream of water or other fluid, particularly adapted for pumps, and for administering injections and other such like purposes.
103. Thomas Wilson, Birmingham, Warwickshire—Improvements in breech-loading fire-arms.
104. John Davis, 18 Frith Street, Soho—Improvements in music stands, part of which is also applicable to tents for military and other purposes.
105. John A. Coffey, Providence Row, Finsbury—Improvements applicable to or connected with steam engines, and other motive mechanism, with the view to economise power.
106. Thomas J. Smith, Plaistow Marshes, Essex—An improved machine for printing in more than one colour at a time.
107. Willoughby Smith, Pownall Road, Dalston—Improvements in transferring designs, and in ornamenting glass and other surfaces, also in the manufacture of slides for magic-lanterns.
108. Antoine David, St. Chamond, France—Improvements in jacquard apparatus.—(Communication from Ennemond David, St. Chamond, France.)
109. John Chatterton, Highbury Terrace, and Willoughby Smith, Pownall Road, Dalston—Improvements in treating gutta-percha, India-rubber, and compounds of those substances.

Recorded January 16.

110. Frederick A. Aldridge, 37 Great Dover Street, Southwark—An improved soft water-proof cloth hat.
111. Alexander M. Rendel, 8 Great George Street, Westminster—Improvements in the construction and arrangement of ships of war.
112. Joseph Stenson, Northampton—Improvements in the manufacture of iron.
113. William S. Cope, Hanley, Staffordshire—Improvements in apparatus for preventing accidents at mines.

Recorded January 17.

114. Nathaniel Grew, 47 Parliament Street, Westminster—Improved pressure and vacuum gauges for steam, water, gas, or other fluids.
115. William Hughes, Manchester—Improvements in metal ties or fastenings for packing bales of cotton, wool, or other fibrous substances, which improvements are also applicable to packing bales of manufactured goods.—(Communication from Charles Hughes, New Orleans, America.)
116. Samuel Fearnley, Rochdale, Lancashire—Improvements in looms for weaving looped or pile fabrics, some parts of which improvements are applicable to other kinds of looms.
117. David Vogl, Sambrook Court, Basinghall Street—Improvements in knapsacks, haversacks, and such like portable receptacles.
118. Richard A. Brooman, 166 Fleet Street—Improvements in extracting substances from cereal grains, and some of their products, and the application of the substances extracted.—(Communication from Benjamin P. Javal, Paris.)
119. David F. L. Ruchet, Jacob Vonwiller, and Frederich Seiler, Paris—An improved rotatory machine, to be used as a water wheel, steam engine, or pump, and for transmitting at any distance motive power.
120. John F. Spencer, Adelaide Place, London Bridge—Improvements in steam engines for propelling ships and other vessels, and for other purposes.
122. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the insulation of submarine electric telegraph wires.—(Communication from John M. Batchelor, Cambridge, Massachusetts, U. S.)
123. Thomas G. Dawes, Wolverhampton, Staffordshire—A new or improved compressed air and exhaustion hammer.
124. Job Goulson, 37 Ponsonby Place, Vauxhall Bridge Road, Westminster—Improvements in gas meters.
125. Charles Norton, St. Martin's Place, Camden Street, Camden Town—An improved portable scaffolding, adapted for constructing, ornamenting, and repairing buildings, and for the removal of goods and persons therefrom in cases of fire.

Recorded January 18.

126. Henry Medlock, Great Marlborough Street—Improvements in the preparation of red and purple dyes.
127. George J. Barker and Thomas Barker, Chillington Iron Works, Wolverhampton, Staffordshire—Improvements in machinery or apparatus for manufacturing shoes for horses and other animals.—(Communication from Henry Burden, Troy, U. S.)
128. William Smith and Prince Smith, Keighley, Yorkshire—An improved process of hardening cast-iron caps used in machinery for spinning and doubling wool, cotton, silk, flax, mohair, and other fibrous substances.
129. Alexander Chaplin, Glasgow—Improvements in engines for drawing or conveying heavy loads.
130. William W. Hewitson and Benjamin Walker, Leeds—Improvements in steam hammers.
131. Godfrey Ermen, Manchester, and John Platt, Oldham, Lancashire—Improvements in machinery or apparatus for spinning, winding, and doubling cotton and other fibrous materials.
132. Siegerich C. Kreeft, Fenchurch Street—Improvements in the permanent way of railways.—(Communication from Carl von Etzel, Vienna.)
133. John B. Berger, Upper John Street, Fitzroy Square—An improved mode of, and apparatus for, ascertaining the proper course to steer ships or vessels.
134. Johann Schuberth, Vienna, Austria—Improvements in nails and similar articles, and in preparing materials for the production thereof, and of buttons and various other articles to which the same may be applicable.
135. Nicholas D. Maillard, York Street, Dublin, Ireland—Improvements in the means for steering and indicating the course, or direction and time, of ships and other navigable vessels at sea, which improvements are also applicable to other purposes.

Recorded January 19.

136. Thomas Curtis and Jonathan Haigh, Leeds, Yorkshire—Improvements in machinery to be used in finishing cloths or fabrics having nap or pile on their surfaces.
137. Harrison Blair, Kearsley Works, Farnworth, Lancashire—Improvements in the production of carbonic acid gas.
138. William Dawes, Compton, Staffordshire—Improvements in the manufacture of metal shoes for beasts of draught and burden, and in the machinery or apparatus to be used in such manufacture.
139. Joseph Needham, Piccadilly—Improvements in the application of the rise and fall of the waves to the propulsion of vessels.
140. Anthony Bower, Liverpool—Improvements in ship building.

Recorded January 20.

141. William Griffith, Hitchin, Herts—Improvements in propelling vessels and locomotive carriages.
142. Thomas Gray, Carr's Hill Glass Works, Gateshead, Durham—Improvements in the manufacture of goblets, and other similar articles in glass, and in the apparatus connected therewith.
143. William Clissold, Dudbridge, Gloucestershire—Improved machinery for grinding vegetable, mineral, and other substances.
144. John Timmins, Runcorn, Cheshire—Improvements in the construction of safety cages and hoists for raising and lowering weights in mine and other shafts.
145. Paul Moore and Paul Moore, the younger, Birmingham, Warwickshire—Improvements in the manufacture of the dies or draw plates used in drawing wire and tubes, and for other similar purposes.—(Communication from J. J. Eagleton, New York, U. S.)
147. George H. Cottam and Henry R. Cottam, St. Pancras Iron Works, Old St. Pancras Road—Improvements in the manufacture of chairs, bedsteads, and other articles to sit or recline on.
148. Thomas K. Callard, 4 Blenheim Terrace, St. John's Wood—Improvements in preparing wheaten flour.
149. Ferdinand J. J. de la Ferte, 36 Porchester Terrace—Improvements in reproducing photographic and other pictures, engravings, prints, devices, and designs, on the surfaces of glass, ceramic, and other substances requiring to be fired to fix the same thereon.—(Communication from Henry Garnier, 71 Rue Notre Dame des Champs, Paris.)
150. Thomas F. Allen, 3 Elizabeth Terrace, Hackney Wick—Improvements in bait cans for fishing purposes.
151. John F. Meakin, Baker Street—An improvement in envelopes.

Recorded Jonuary 21.

152. Henry Walker, Gresham Street, and of Alcester, Warwick—Improvements in putting up needles and other small articles.
153. Charles P. P. Laorens, Rouen, France—Improvements in the manufacture of chlorine.
154. John W. Scott, Worcester—Improvements in plates for attaching buttons to garments and other articles, in button shanks and in buttons.
155. Julien F. Belleville, Paris—Improvements in steam generators.
156. William E. Gedge, 4 Wellington Street South, Strand—Improvements in retorts, for the distillation of bituminous schists.—(Communication from Jacques A. Gossot, Epinac, France.)
157. William E. Gedge, 4 Wellington Street South, Strand—Improved prop for supporting plants.—(Communication from Lambert Gres, Haybes, France.)
158. Octave Vivier, Birmingham—Improvements in keyless watches.

159. Benjamin J. Spedding, Birkenhead, Chestershire—Improvements in apparatus for generating gas from oily and fatty substances, and in coolers and holders or gasometers.
161. Restel R. Bevis, Birkenhead—Improvements in marine steam engines.
162. Alexander M'Dougall, Manchester—Improvements in the preparation of materials used for sizing, dressing, or finishing yarns or threads, and woven fabrics, applicable also to sizing paper.
163. Leon E. David and Jean A. Vercher, 29 Boulevart St. Martin, Paris—An improved break for vehicles.

Recorded January 23.

164. François J. Ferry, Rupert Street—Improvements in harnessing horses or other animals to carriages or vehicles.
165. Martin Rae, Manchester—Improvements in roughening or obscuring glass globes, tubes, or other vessels.
167. Murray Anderson, Tollington Park, Hornsey Road—Improved ventilating apparatus.
168. Alfred V. Newton, 66 Chancery Lane—Improved apparatus for regulating the delivery of yarn from yarn beams.—(Communication from Luther Robinson, Boston, U S.)
169. Robert F. Finlay, Queen Street, Edge Hill, Liverpool—A new method of reefing and furling the sails of ships and vessels from the decks thereof.

Recorded January 24.

170. John Appleby, Manchester—Improvements in arrangements for, and in the manner of, embossing or finishing the surfaces of woven fabrics, to produce thereon certain appearances, designs, or patterns.
171. Emile Louis Gatellier, La Ferte-sous-Jonarre, France—Improvements in the manufacture of the crucibles, muffles, or pots, used for the reduction of the ores of zinc.
172. Charles C. J. Guffroy, 3 Duke Street, Adelphi, Westminster—An improved smoke consuming apparatus, and also an improved method of introducing the coal or fuel into it.
173. John Calvert, 189 Strand—Improved methods of easing and distributing the strain on ships' cables when subject to great tension or pressure.
174. Charles H. Reed, Sunderland, Durham—Certain improvements in the construction of anchors.
175. Charles Iliffe, Birmingham, Warwickshire—Improvements in double shell buttons.
176. Edward J. Hughes, Manchester—Improvements in the manufacture of certain matters by the oxidation of salts of aniline, and other salts of a similar nature.—(Communication from Paul Depoully and Charles Lauth, Clichy, France.)
177. Henry Blaxland, Sittingbourne, Kent—An improved churn.
178. Timothy Harrington, Gracechurch Street—Improvements in steam engines and boilers.
179. Joseph T. Carter, Sydenham, Kent—Improvements in machinery for tilling the soil and in engines and boilers for driving the same, and other agricultural implements.
180. Walter Hulme and Thomas D. Hulme, Congleton, Cheshire—Improvements in machinery or apparatus for propelling ships and vessels on the water.
181. George E. Donisthorpe, Leeds, Yorkshire—An improvement in making cop tubes.
182. Joseph Barrans, 2 Caledonian Road, Queen's Road, Peckham—Improvements in steam boilers.
183. Isaac L. Bell, Newcastle-on-Tyne—An improvement in supplying hot blast to furnaces.

Recorded January 25.

184. Edward C. Nicholson, Kensington Road, Surrey—Improvements in the production of colours for dyeing and printing.
185. Frederick Yates, 31 Parliament Street, Westminster—Improved apparatus for generating certain gases to be used as fuel, and as reducing agents in metallurgic and other operations, and improvements in furnaces to be heated and worked therewith.
186. John Dixon and Robert Clayton, Bradford, Yorkshire—Improvements in rolling and shaping iron and steel for manufacturing railway wheels.
187. Theodore Ramspacher and Christophe F. Schemidt, 2 Rue Ste. Appoline, Paris—Preparing wire gauze to render it applicable to various purposes.
189. Thomas Donkin, Bermondsey, Surrey—An improvement in paper making machines.
190. Frederic G. Grice, West Bromwich, Staffordshire—Improvements in the manufacture of nuts for screws, and in machinery employed in the said manufacture.
191. François A. Kieffer, 23 Rue Oudinot, Paris—Improvements in fabrics suitable for straps for driving machinery and for other purposes.
192. Andrew G. Hunter, Pentre Alkali Works, Flint, North Wales—Improvements in the separation of sulphur from its combinations with certain metals.
193. Horatio J. Huggins, Island of St. Vincent, West Indies—Improvements in filtering and decolorizing cane juice, solutions of sugar, and other liquids, and in the manufacture of sugar.
194. George Ryder, Park Street, Lenton, and John Clay, the younger, Butcher Street, Nottingham—A high pressure stop valve or cock.
195. Jean P. Lamar, Bush Lane—Improvements in boots, shoes, and similar foot coverings, in fixing the heels and soles thereof, and in apparatus for forming and applying screws for the foregoing and other purposes.—(Communication from Charles Jarrin, Rue Bourbon Villeneuve, Paris.)

Recorded January 26.

196. Septimus Beardmore, 27 Albion Street, Hyde Park—Improvements in electric telegraphs.
197. William Brindley, Queenhithe, Upper Thames Street—Improvements in the manufacture of paper-board, known by paper makers as "middles" extensively used in the manufacture of boxes.
198. Thomas Banks, Ipswich, Suffolk—Improvements in gas pipe tongs.
199. Arthur C. Hempel, Ramsgate, Kent—Improvements in fire escapes.
200. John Ingham, and George Hinchliffe, Bradford, Yorkshire—An instrument or apparatus to facilitate and simplify calculations, and particularly adapted for computing the weights of cotton warps, applicable also for woollen and worsted warps, and warps of other fibrous substances.
201. Peter Effertz, Manchester—Improvements in machinery or apparatus for making bricks.
202. Thomas W. Plum, Blaenavon Ironworks, Monmouth—Improvements in preparing and fixing iron and other metal plates to ships and other structures.
203. Jean J. Maurer, 29 Boulevart St. Martin, Paris—An improved propeller applicable to various purposes.
204. William E. Newton, 66 Chancery Lane—The manufacture of gold in a new form, and its use in such form for filling or plugging teeth.—(Communication from Alfred J. Watts, Utica, New York, U. S.)

Recorded January 27.

205. Magloire O. Dammann, 13 Queen's Road, Haverstock Hill, St. Pancras—An apparatus with chemical process producing fumigations for the cure of the gout, rheumatism, nervous debility, and disease of the skin.
206. Cromwell F. Varley, 4 Fortress Terrace, Kentish Town, St. Pancras—Improvements in electric telegraphs, part of the invention being applicable to other purposes.
208. Reuben Sykes and Philemon Sykes, Huddersfield, Yorkshire—Improvements in machinery or apparatus employed in spinning, twisting, and roving wool and other fibrous substances.
209. Frederick Walton, Haughton Dale, Denton, near Manchester—Improvements in the manufacture of varnish, and in treating oils, also in the application of products obtained therefrom.
210. Jean P. C. Guerrier, 29 Boulevart St. Martin, Paris—Improved apparatus for splitting and preparing the cane for various purposes.
211. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in inkstands.—(Communication from Howell Evans and Henry Howson, Philadelphia, U. S.)
212. James Duncan, Alexander Scott, and James Dawson, Greenock, Renfrewshire—Improvements in re-burning animal charcoal, and in the application of the products arising therefrom, and in the apparatus employed therein.
213. John Brigham, Berwick-upon-Tweed, North Britain—Improvements in machinery or apparatus for sowing or depositing seeds in land.
214. William E. Newton, 66 Chancery Lane—An improved folding frame, designed for umbrellas, parasols, tents, awnings, sun blinds, and other analogous structures.—(Communication from L. K. Selden, Haddam, Middlesex, Connecticut, U. S.)
215. William E. Newton, 66 Chancery Lane—Improved machinery for printing addresses on newspapers and on wrappers or envelopes, also for punching or indentating wooden or other blocks, or plates, from which the addresses are to be printed.—(Communication from Robert W. Davis and Daniel Davis, Chemung, Elmira, New York, U. S.)

Recorded January 28.

216. James Nicholson, Middleton's Buildings—An improved main cock or tap for regulating and indicating the supply of gas.
217. John Wilkes, Thomas Wilkes, and Gilbert Wilkes, Birmingham, Warwickshire—A new or improved method of manufacturing wire for electric telegraphs, and for such other uses as the same is or may be applicable to.
218. Alexander Gray, Glasgow—Improvements in power looms.
219. James Lord, Rochdale, Lancashire—Improvements in machinery or apparatus employed in the manufacture of cotton and other fibrous materials called "roving frames" and "doubling frames."
220. Christopher N. Nixon, Ramsgate, Kent—Improvements in the construction of mangles, the same being also applicable to other machinery for the pressure of textile fabrics and other substances.
221. Thomas Dunn, Pendleton, near Manchester—Improvements in machinery and apparatus for altering the position of locomotive engines and carriages, and for preventing injury and accidents on railways.
222. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the steeling and cementation of metals.—(Communication from François A. Dufey, Paris.)
223. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in blowing engines.—(Communication from Edouard F. Fossey, Paris.)
224. Edward C. Nicholson, Kennington Road, Surrey—Improvements in the production of colours for dyeing or printing.
225. Robert W. Savage, 15 St. James Square, Westminster—Improvements in tidal ladders, and in steps for embarking and landing purposes.
226. Julius Jeffreys, Richmond, Surrey—Improvements in sun blinds.
227. Thomas B. Daft, Tottenham—Improvements in coating iron.
228. William E. Newton, 66 Chancery Lane—Improved machinery for carding silk, silk-waste, and other filamentous substances.—(Communication from Antoine L. Warnery, Paris.)
229. Eugen Langen, Cologne, Prussia—Improvements in steam boiler and other furnaces.

Recorded January 30.

231. Henry Bosshardt and Otto Dingler, Paris—Improvements in machinery for treating cotton and other fibrous materials.
232. Thomas Walker, Birmingham, Warwickshire—Improvements in means for cleansing sewage and other waters.
233. Henry Hodgson, Ballyreine, Wicklow, Merlin Park, Galway, and Patrick M. Crane, Irish Peat Works, Athy, Ireland—Improvements in manufactures from peat.
235. Joze Luis, 1B Welbeck Street, Cavendish Square—Improvements in the apparatus for preparing and clarifying resinous substances.—(Communication from Dromart and Dusillol, Brothers, Paris.)
236. George Nurse, Pontyminster, Risca, Monmouthshire—Improvements in the manufacture of tin or "terne," and galvanised metal plates.
237. Henry E. Brown, Woolwich, Kent—Improvements in axles for carriages.
238. Edward Brooks, Birmingham, Warwickshire, and Henry Waters, Smethwick, Staffordshire—New or improved machinery to be used in the manufacture of guns and pistols, and for shaping metallic and non-metallic substances for other purposes.
239. Josiah Swain, Hyde, Cheshire—Certain improvements in fire-bars, and in the means of actuating or shifting the same.
240. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in hot air engines.—(Communication from Stephen Wilcox, the younger, Westerley, Washington, U. S.)
241. Benjamin Matthewman, jun., Headford Street, Sheffield, Yorkshire—Improvements in pen and pocket knives, scissors, and every other description of cutlery.
242. George A. Cator, Selby, Yorkshire—Improvements in machinery for preparing flax, hemp, and other vegetable fibrous substances, for scutching, or other manufacturing processes.
243. William E. Newton, 66 Chancery Lane—An improvement in the construction of soldering irons.—(Communication from Maria L. Burbank, Brooklyn, New York, U. S.)

Recorded January 31.

244. Abraham Ripley, 42 Bridge Street, Blackfriars—The application of the shavings, parings, and refuse of hides and leather to a new manufacture, and in the process and mode of treating or operating the same, in order to produce the said new article or fabric.
245. William Tait, Glasgow—Improvements in distilling apparatus.—(Communication from Thomas M'Farlane, Demarara, British Guiana.)
246. George Smith, Glasgow—Improvements in monuments, fountains, lamps, letter-boxes, urinals, and such like ornamental and public erections in cast-iron.
247. Leonard Appleton, 25 Clarence Road South, Kentish Town—The arrangement and expeditious removal of patterns, invoices, letters, papers, &c., more particularly tailors' patterns.
248. Alfred A. Larmuth, Salford, Lancashire—Certain improvements in "healds" employed in looms for weaving.
249. Thomas Smith, 9 Gloucester Terrace, Cambridge Heath—Improvements in the manufacture of chenile, and in apparatus employed therein.
250. William E. Newton, 66 Chancery Lane—Improved machinery for cutting dovetails.

—(Communication from Thomas H. Burley, Charles H. Phelps, and William J. Lowerra, New York, U. S.)

251. George Owen, Bedford Row—Improvements in rocking-horses, see-saws, and other analogous vibrating or oscillating contrivances.

252. Thomas Culpin, 24 Dowgate Hill—Improvements in water-closets, and all sanitary vessels that require frequent flushing.

253. Richard A. Brooman, 166 Fleet Street—Certain arrangements of machinery for forming slivers as they come from the carding engine into threads, and for winding threads on bobbins.—(Communication from Louis V. Lemaignen, Lisieux, France.)

254. Edmund Walker, London Street—Improvements in windlasses.

255. Richard J. Cole, 21 Chepstow Villas West, Bayswater—Improvements in pencils and in holders for the same.

256. Ferdinand Jossa, Sunderland, Durham—Improvements in the manufacture of sal ammoniac from small and refuse coals, and from the gas generated in the manufacture of coke.

Recorded February 1.

257. William Hartley, Bury, Lancashire—Certain improvements in steam engines.

258. Thomas Hill, Heywood, Lancashire—Improvements in steam boilers.

259. Benjamin Shaw, Wellington, Salopshire—Improvements in stench traps, and in the cesspools or pits of sewers.

261. Alexander Stoddart, Tours, France—Improvements in submarine telegraph cables.—(Communication from John S. Davison, New Jersey, U. S.)

262. Gustavus P. Harding, Bellville, Paris—Improvements in hats and similar coverings for the head.

263. George A. Huddart and Joseph D. E. Huddart, Brynkir, Carnarvonshire—Improvements in obtaining motive power.

264. John W. Matthews, High Street, Poplar—An improvement in the manufacture of hats.

265. William E. Newton, 66 Chancery Lane—Improved apparatus for retarding railway carriages.—(Communication from Augustin Castellvi, Saragossa, Spain.)

Recorded February 2.

266. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—Improved machinery for stripping and extracting the filaments of textile plants, and applicable to the treatment of fibro-ligneous matters in general.—(Communication from Adolphe Boye, Paris.)

267. Abdiel Hawkins, 65 Hatton Garden—Finishing machine wrought wood carvings, and also for finishing certain wood carvings rough hewn or cut by hand-labour.

269. Louis J. Brethon, Tours, France—An improved press for the compression of bricks, tiles, and similar articles of either plastic or other suitable compressible materials.

270. John Yule, Glasgow—Improvements in steam boilers.

271. John Reynolds, 32 St. James' Road, Halloway—An improvement in constructing an endorsing, printing, and stamping press.

272. George Redrup, Loughborough Brewery, Loughborough, Leicester—Improvements in the means of, and apparatus for, obtaining and applying motive power, whereby perpetual motion may be obtained.

273. William Fitzgerald, Fleet Street—The productions of hands or strips for application on petticoats and similar ornamental purposes.

274. Thomas Routledge, Eynsham Paper Works, Oxford—Improvements in the manufacture of paper.

276. Abraham Denny and Edward M. Denny, Waterford, Ireland—An improved method of and apparatus for singeing pigs.

277. William H. Tooth, Spring Terrace, Wandsworth Road, Surrey—Improved machinery or apparatus to be employed in the manufacture, melting, or refining of iron and steel, and in the manufacture of puddled steel and wrought iron.

Recorded February 3.

278. John Gedge, 4 Wellington Street South, Strand—Improvements in amalgamating metals or producing alloys.—(Communication from Johann Aich, Venice.)

279. Leon P. Barre, 4 South Street, Finsbury—Certain improvements in steam boilers.

280. Alexander Watkins, 67 Strand—Improvements in time-keepers.

281. James Harper, Wilson Street, Belfast—Improvements in roving frames.

282. William Howes, and William Burley, Birmingham, Warwickshire—A new or improved method of attaching lamps and whip sockets to carriages.

283. John Hall, Blackburn, Lancashire—Improvements in sewing machines.

284. Thomas Blackburn and Mark Knowles, Blackburn, Lancashire—Improvements in beams for warping, sizing, and dressing, and weaving machines.

285. Robert Adams, King William Street—Improvements in breech loading guns and in making up catridges for the same.

286. Robert Fielden, jun., and Thomas Fielden, Walsden, Lancashire—An improvement or improvements in machinery for cutting hides or skins into fillets, strips, or shreds, and also in the manufacture of pickers, to be used in looms for weaving, and apparatus connected therewith.

287. William Lurberg, Wellington Road, Surrey—A new or improved method of employing tan or spent bark for chemical purposes.

288. Rudolph Bodmer, 2 Thavies Inn, Holborn—Improvements in machinery for converting into down or fibres capable of being spun, the remnants or cuttings or other waste pieces of silk or other fabrics.—(Communication from Charles Luvandoski, Paris.)

289. William E. Newton, 66 Chancery Lane—Improvements in piston packing.—(Communication from Charles Lowery, Brooklyn, and Horace A. Miller, New York, U.S.)

290. Richard A. Brooman, 166 Fleet Street—An improvement in the manufacture of iron, and in furnaces to be employed therein.—(Communication from Ernest Tourangin, Paris.)

291. Richard A. Brooman, 166 Fleet Street—An improvement in tanning.—(Communication from Laurent Rocher, Saumur, France.)

Recorded February 4.

292. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved means of joining surfaces of leather.—(Communication from A. L. D. Lacour, Paris.)

293. Jacob G. Willans, 2 Clarence Place, Belfast—Improvements in the manufacture of soda.

294. James Taylor, Birkenhead—Improvements in locomotive engines and wheel carriages.

295. Andrew Keir, Newton Heath, Lancashire—Improvements in jacquard machines.

296. Julius G. Dahlke, Kingsland Road—Improved filtering compositions, and improvements in filtering vessels and apparatuses.

297. Edward W. Uren, Hoomeavy-Meavy, Devonshire—Improvements in a rotalory steam engine.

298. Patrick Robertson, Sun Court, Cornhill—Improvements in brewing beer, ale, and porter, also in separating brewers' worts from grain and beer, ale, and porter from yeast and other matters, and also in apparatus used for these and like purposes.

300. Francois Lespadin, Paris—An improved mode of manufacturing decanters, and other similar articles in glass or crystal, of a rounded form.

301. Charles T. Launoy and Auguste M. A. D. de Vernez, Paris—An improved valve or cock for regulating or stopping the passage of gas, steam, water, or other fluids.

302. Charles T. Launay and Auguste M. A. D. de Vernez, Paris—An improved apparatus for carburetting hydrogen or other gas for illuminating purposes.

303. Joseph Inchley, Birmingham, Warwickshire—Improvements in propelling canal boats and other vessels.

305. John Birch, Birmingham, Warwickshire—Improvements in the construction of smoke-consuming furnaces.

306. Alfred V. Newton, 66 Chancery Lane—An improved construction of combination steam-gauge.—(Communication from E. G. Allen, Boston, U. S.)

307. Alfred V. Newton, 66 Chancery Lane—An improvement in the construction of ships' stoves.—(Communication from George A. New, New York.)

308. John Smith, Birmingham, Warwickshire—Improvements in the manufacture of handles or knobs for sticks, umbrellas, and parasols, for swords, knives, forks, and other articles of cutlery, for pistol butts and small arms, stocks, and for other similar articles.

309. John Smith, Birmingham, Warwickshire—Improvements in the manufacture of furniture for doors and drawers, bell levers, curtain band, cornice pole, and lamp and chandelier enrichments, and the ornamental part of other similar articles.

Recorded February 6.

312. John W. Walton, Esther Cottages, Ponder's End—Improvements in rifles and other small fire-arms.

313. Alfred V. Newton, 66 Chancery Lane—An improvement in laying submarine electric telegraph cables.—(Communication from James B. Alexander, New York.)

314. Alfred V. Newton, 66 Chancery Lane—An improved mode of producing certain compounds of lead.—(Communication from Ferdinand F. Mayer, New York.)

315. William McNaught, Rochdale, Lancashire—Improvements in steam engines, and in apparatus connected therewith.

316. Carl H. Roeckner, Marsh Street, Bristol, Somersetshire—Improvements in the construction of millstones for grinding.

317. Thomas Tye and Charles W. Andrew, Brixton Road, Surrey—An improved method of trapping sinks, especially adapted for kitchen and scullery sinks in domestic dwellings to prevent escape of noxious effluvia therefrom.

Recorded February 7.

321. Auguste P. Gaillard, 29 Boulevart St. Martin, Paris—Improvements in vessels for containing solid or fluid matters of all sorts.

323. Henry C. Jennings, 8 Great Tower Street—Improvements in the manufacture of pulp.

325. William E. Newton, 66 Chancery Lane—Rendering waste "vulcanised," "hermised," and "changed" or "converted" India-rubber and India-rubber compounds, useful and capable of being reworked for the manufacture of a great variety of articles of trade and commerce.—(Communication from John H. Cheever, New York.

327. Collinson Hall, Navestock, Essex—Improvements in steam-tilling machinery and apparatuses.

329. Edmund Lea, Hill Top, West Brômwich, Staffordshire—An improvement or improvements in the manufacture of iron and steel tubes.

Recorded February 8.

331. George Jenkins, Tyne Cottage, Hanwell—The application of the dovetail joints in iron or other metal, to wooden bedsteads, couches, sofas, and other such like articles of furniture, together with metallic sides, ends, and laths securely fixed thereto by means of the dovetail joints.

333. William Wain, Copenhagen, Denmark—Improvements in steam engines, and in apparatus for superheating steam.

335. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in obtaining motive power and in the machinery or apparatus employed therein—(Communication from Jean J. E. Lenoir, Paris.)

337. William Pidding, Borough Road, Southwark, Surrey—Improvements in needles.

339. William Beard, 62 Cannon Street West—Improvements in adapting beadwork and buglework to harness and whip handles.

341. Julius E. Durand, Paris—The manufacture of poppy paper.

343. William E. Newton, 66 Chancery Lane—Improvements in rails, rail supports, and fastenings and the nut fastenings of rail bolts for the permanent way of railroads.—(Communication from George W. R. Bayley, Brashear, Louisiana, U. S.)

345. John Langford, Orzen Street, and Charles Chester, Bloomsgrove, Radford, Nottingham—Improvements in cooling liquids.

Recorded February 9.

347. George F. Wilson and William C. Wilson, South Kirby, near Pontefract, Yorkshire—Improvements in the manufacture of ridge-stones, and scythe-stones, and in the machinery or apparatus employed for that purpose, which machinery is also applicable for other similar purposes.

351. William A. Gilbee, 4 South Street, Finsbury—Improvements in treating saccharine fluids.—(Communication from Edmond Peiser, Valenciennes, France.)

353. John R. Smith and Christopher Bolland, Sheffield—Improvements in fenders and fire-guards.

355. William Oxley, Manchester—Improvements in apparatus for extinguishing fires in manufactories and other buildings.

TO READERS AND CORRESPONDENTS.

Commencement of Volume V., Second Series, of the Practical Mechanic's Journal.—The present Part, No. 145, is the commencement of the fifth volume, second series, of this *Journal*, or the thirteenth volume, including the first series. The entire set of volumes may be had from any bookseller, in cloth, lettered in gold, price 14s. each; or the whole 144 parts may be purchased separately, as originally published, at 1s. each—any single part being obtainable. The whole twelve volumes may also be had, handsomely bound in half calf, in six double volumes, twenty-four parts in each, with the Plates bound separately to correspond—price 31s. 6d. for each double and its separate volume of Plates. Volume IV., Second Series, contains nineteen quarto pages of copperplate engravings, nearly 500 engravings on wood, and 344 pages of letterpress.

On the Production of Electric Force.—We shall be glad if our readers will make the following corrections in our first article of last month:—Page 309, col. 1, line 33—Instead of "a cheap method" read "a cheaper or more convenient method." Line 34—After the word "electricity" insert "than is at present known." Line 60—Instead of "the quantity of friction" read "the quantity of electricity." Col. 2, line 64—Instead of "or by electryolis," read "or by electrolysis." Page 310, col. 1, line 6—Instead of "meta-stamic acid" read "meta-stannic acid."

J. H. D.—See Fairbairn "On the application of cast and wrought-iron to building purposes,'' published by Weale, 59 High Holborn, London.

MACHINERY:

ITS INFLUENCE ON THE MANUFACTURER, THE WORKMAN, AND THE PUBLIC.

It must be useful to show that in all manufactures or operations involving processes occurring in sequence, and which are repeated often, the use of machinery is indicated in preference to that of manual labour. For instance, it no more becomes a man to devote his whole life and energies to the manufacture of a pin's head than to the dragging of a cart. The former is the natural work for machinery to do—the latter is that destined for asses, horses, and other beasts of burthen. The proper work for man to do, in relation to the various processes necessary in carrying out any manufacture or other operation, is to employ that quality of power with which he is endowed by the Almighty, and thus to make stubborn matter a servant, by using its particular forces for his benefit. Man is the recipient of will—power and the rational faculty from his Creator; the free use of these conjoined, give him free will to act in accordance with the divine laws, ensure his individuality, and enable him to bring his energy of will and rationality of mind to bear upon those requirements of life, which, by various manufactures, he seeks to supply in quantities commensurate with the demand. The divine attributes which are finited in man he ought to employ in preference to those which are the distinctive characteristics of a lower order of nature; if, therefore, a man neglects the use of his higher powers, and constantly employs the lower forces of his being, he reduces himself to the level of the lower animals. Matter, connected as it is with the forces which bind the constituents of our globe together, yields up dynamic forces, and forces of resistance to strain, infinitely greater than those capable of being eliminated from either human or animal organisms; and as these qualities are so eminently possessed by matter, they should be accepted by a rational man from matter, and not squeezed by him out of some unfortunate fellow creatures. It is by no means advocated that man is not to use his muscles; but it is contended that the mind and muscles ought to have equal use, and that, to keep the human organism healthy, the physical powers should not be cultivated at the expense of the mental energies. A man is made up of moral, mental, and physical powers, and when these three act in unison, the highest and noblest results are attained; but, if either faculty is cultivated at the expense of the others, man degenerates in the scale of creation.

Although matter cannot be said to possess intelligence itself, it preserves the intellectual ideas impressed upon it by man, and thus becomes able to guide its own forces, and to regulate their duration and frequency. The substitution of machinery for hand labour, in its fullest sense, is equivalent to employing matter to guide forces and regulate them in the sequence required by the operation to be performed.

When the place of hand labour is first supplied by machinery in any branch of manufacture, the wages of those who still endeavour to obtain employment in the working of that particular branch *by hand* are reduced; but those who have the ability to embrace other employments, and particularly the manufacture or use of the machines which have usurped their ordinary handicraft, reap the advantage of their knowledge or genius, and, by the increased demand for the manufacture, ultimately make more wages than they would formerly have made by hand labour. When the use of machinery was in its infancy, this reduction of wages had more evil effects than it has at the present day, or will ever have again, for the spread of education and moral culture has widened and will widen the abilities of men, and teach them that certain general knowledge especially aids their advance in life. Who so capable as the transcribers whose wages were lowered by the introduction of printing, to undertake the duties of compositors and readers in a printing establishment?—fitted both by their literary attainments and by the similarity of the employments which they would respectively have to give up and to embrace. It is obvious that, with a stout heart and a clear head, all the difficulties of the new style of things would be quickly mastered, the condition of the *ci-devant* transcriber would be ameliorated, and where one copy was produced, thousands of comparatively permanent copies would be sent forth to the world, in their turn to call forth latent energy, and to disseminate knowledge.

The history of power-looms and saw-mills shows results equally favourable to the general adoption of machinery. All improvements, and amongst the rest the use of machinery in manufacturing processes, substitute extensive employments for circumscribed ones. Society at large participates in the additional production, and is benefited thereby. The general adoption of machinery will bear the test of profit and loss; it is also consonant with the same reasoning which sanctions division of labour, and its advantage, furthermore, is proved practically by an appeal to statistics.

To further elucidate and illustrate the influences we have indicated, we shall set forth a few examples of the extensive application of machinery to manufactures, and trace out the results.

We will first take Printing.

The dearness of books before the invention of printing is shown by the following facts:—In the year 855, Lupus, Abbot of Ferrières, in France, sent two of his monks to Pope Benedict III., to beg a copy of *Cicero de Oratore* and Quintilian's Institutes, and some other books; "for," says the abbot, "although we have part of these books, yet there is no whole or complete copy of them in all France." In the year 1174, Walter, Prior of St. Swithin's at Winchester, afterwards elected Abbot of Westminster, a writer in Latin of the lives of the bishops who were his patrons, purchased of the monks of Dorchester in Oxfordshire, Bede's Homilies and St. Austin's Psalter, for twelve measures of barley and a pall, on which was embroidered in silver the history of St. Birinus converting a Saxon king. Among the royal manuscripts in the British Museum there is Comestor's Scholastic History, in French, which, as it is recorded in a blank page at the beginning, was taken from the King of France at the battle of Poictiers; and being purchased by William Montague, Earl of Salisbury, for 100 marcs, was ordered to be sold by the last will of his countess, Elizabeth, for 40 livres. About the year 1400, a copy of John of Meun's *Roman de la Roze* was sold at Paris for 40 crowns, an enormous sum in those days.

In contrasting the present price of books with the facts above cited, the difference is so immense that at the first sight it appears more like a magical transformation than the natural operation of improvements in the production of the article required. The price of the various editions of the Bible is an instance; the translation of Cicero's Orations may now be had (in Bohn's Classical Library) for £1, and the Penny Cyclopædia, (which could not have been produced at all without the aid of printing) may now be purchased for £5 or £6.

Not only has printing multiplied the number of copies of a work, so as to enable that which would have ruined a noble to purchase, to be brought within the reach of all, but the accuracy and beauty of the resulting book has been proportionately increased. Petrarch, in the fourteenth century, says—"How shall we find out a remedy for those mischiefs which the ignorance and inattention of the copyists inflict upon us? It is wholly owing to these causes that many men of genius keep their most valuable pieces unpublished, so that they never see the light. Were Cicero, Livy, or Pliny, to rise from the dead, they would scarcely be able to recognise their own writings. In every page they would have occasion to exclaim against the ignorance and the corruptions of those barbarous transcribers." In contrast with the faults of the transcribers alluded to in this quotation, may be placed the general accuracy of all printed matter at the present day, more especially the Bibles; also the beauty and accuracy of printing performed by self-acting machines may be satisfactorily compared with the "monks and friars," and other irregularities met with in printing by hand machine.

With respect to speed of production, the following examples testify to the vast stride made by self-acting and steam machinery over that worked and driven by hand. By hand machinery, Gutenberg (about 1458) could only print 4 pages at a time at two pulls; presses of newspaper offices, at the beginning of the present century, could only turn out 250 or 300 impressions per hour—now, however, one nine-cylinder Applegath's vertical machine, at *The Times* office, prints 16,000 impressions per hour, and a ten-cylinder Hoe's machine prints 20,000 impressions per hour. In a paper read by Professor Cowper to the Institution of Civil Engineers, in 1851, the following facts and statistics bearing upon the speed and other advantages of steam-printing are set forth:—In 1814, Kœning erected two printing machines at *The Times* office, which produced 1800 impressions per hour, and continued to do so until 1827, when they were superseded by Applegarth and Cowper's four-cylinder machine, producing 5000 impressions per hour. On May 7, 1850, *The Times* and *Supplement* contained 72 columns, or 17,500 lines, made up of upwards of a million pieces of type, of which matter about two-fifths were written, composed, and corrected after 7 o'clock in the evening. The *Supplement* was sent to press at 7.50 P.M., the first form of the paper at 4.15 A.M., and the second form at 4.45 A.M.; on this occasion 7000 papers were printed before 6.15 A.M., 21,000 papers before 7.30 A.M., and 34,000 before 8.15 A.M., or in about 4 hours. The greatest number of copies ever printed in one day was 54,000, and the greatest quantity of printing in one day's publication was on the 1st March, 1848, when the paper used weighed 7 tons, the weight usually required being about 4½ tons; the surface to be printed every night, including the *Supplement*, is 30 acres; the weight of the fount of type in constant use is 7 tons, and 110 compositors and 25 pressmen are constantly employed. The whole of the printing at *The Times* office is actually performed by three of Applegath and Cowper's four-cylinder machines, and two of Applegath's new vertical cylinder machines.

In WEAVING there are also wonderfully beneficial results. The Jacquard apparatus dispensed with the necessity of extreme carefulness and skill on the part of the weaver, and thereby laid open the production of the most costly fabrics to a larger number of operatives. When first invented, Sewell's bobbin-lace machine made four racks a *day* of 140 holes each of net, 36 inches wide; by improvements and the addition of steam power, it now makes five racks an *hour* of 112 inches wide. The application of steam power to Ball's rotatory warp lace machine enables it to weave two kinds of lace (one, fine blonde); stocking net, afterwards cut and sewed; velvet; light worsted cloth for waistcoats; or "anything from a spider's web to a blanket." This same machine, since 1816, had been thrown by or sold for the price of old iron twenty times. Sewing machines now sew in a circle, curve, or straight line, 500 stitches per minute. The cost of burning off the fibres from muslin and other delicate fabrics, some 35 years ago, was at the rate of 6d. per square yard, whereas 600 square yards of lace may now be gassed for the same sum.

The following examples and particulars relating to LOCOMOTION contrast surprisingly with the travelling capacities and requirements of former times, when 10 miles an hour was considered a fearful speed, and 15 miles an hour almost unattainable. "The Cornwall," a locomotive engine designed by M. F. Trevithick, has taken trains at speeds varying from 60 to 70 miles an hour on the North-Western line; this engine was exhibited at the Great Exhibition, 1851. The Great Western Company exhibited a stupendous engine, constructed at their works at Swindon, called "The Lord of the Isles," one of the ordinary class of engines which have been worked for passenger traffic since 1847. It is affirmed that it is capable of taking a train of 120 tons gross at an average speed of 60 miles an hour (the flight of the pigeon) upon such gradients as those which prevail on the Great Western Railway, which is nearly level. The evaporating power of the boiler, when in full operation, is stated at 1000 horse power; and the effective power of the engine, measured by a dynamometer, is equal to 743 horses. Messrs. Hawthorn's locomotive engine (in the Great Exhibition of 1851) is said to be able to run with safety at a speed of 80 miles an hour with a large express train. "Ariel's Girdle" (also in the Great Exhibition of 1851) is a four-wheeled locomotive engine coupled to a four-wheeled carriage, and is capable of running with great speed and safety 50 or 60 miles without stopping. Since the dates here quoted, vast changes in locomotive machinery have taken place—not so much, however, as regards high rates of travelling and the weights conveyed, as the economy of fuel and working expenses.

Other applications of machinery to the wants of man might be cited, but the foregoing are sufficient to show the immense advantages derived from its use, and that there is no one instance in which these benefits ought to be denied to man when such application is possible. It is a common opinion amongst a certain class of the community, that the introduction of machinery into any manufacture ought always to be looked upon with suspicion, and that the question should be asked in all earnestness, "Will the ultimate benefits derivable from the adoption of machinery be sufficient to more than counterbalance the effect of the reduction of wages upon the workman, and of the increased powers of production possessed by large manufacturers upon those who cannot afford machinery, and whose interests are largely wound up in the existing state of things?" In answer to this important question—it is doubtful whether any present or circumscribed inconvenience, or even distress, should not be manfully endured for the sake of a future and wide-spread benefit; this self-sacrifice, however, will be necessary in a more limited degree, as the use of machinery, and the dissemination of knowledge, becomes more general, as will be shown in the sequel.

The effects which have hitherto followed from the introduction of machinery have been eminently beneficial to all, not only consumers but producers, for whilst it has cheapened the price, and increased the accuracy and beauty of the article in the eyes of consumers, it has increased the demand for the article, and thus enriched manufacturers and workmen. It is true that, from the short-sightedness of a class, and in most cases of the workmen under the old process, strikes and other mischievous manifestations of discontent have followed the first application of machinery to useful purposes; but it has been shown in the introduction to this article that, as education becomes diffused, and as the benefits conferred by machinery itself become extended, each class (manufacturer, workman, and consumer) will equally hail the introduction of machinery as a boon not to be refused or treated with disdain and discontent.

The manufacturer will look upon machinery, not as the means by which he can ruin a brother manufacturer by the advantage which capital, invested in mechanical arrangements, would give him, but as a means for increasing the demand for the article itself, and thus benefiting his neighbour as well as himself; for, when, by the adoption of machinery, any article of usefulness is produced at a less cost and in greater beauty and perfection than before such aid, that which has been confined to the wealthy is now looked upon as the requirement and want of all. The effects of printing, and especially of newspaper and steam-printing, illustrate this point wonderfully. When books were only to be bought in manuscript, and by the sale of estates, very few knew their value, and their use was principally confined to the clergy, and to the nobles of the land; but when printing began its sacred work of the diffusion of knowledge, books became the want of the age, and now nearly all the ideas worth perpetuating find their way into print. In the morning at breakfast, a *printed* newspaper gives piquance to the meal; the bill of fare at most public dining-rooms is now *printed*; and the tea we partake of for the evening meal is taken from its *printed* wrapper. The introduction of power-looms and of self-acting machinery into weaving processes, tells us a similar tale; for, when clothing became an heir-loom in families, cleanliness, variety and elegance in dress, were not so attainable as they are now. Increased facilities of locomotion also induce increased desires to travel, and thus promote the diffusion of liberal ideas, of knowledge, and of social intercourse.

The workman will look upon the introduction of machinery into that branch of the manufacture which he is accustomed to perform by hand, not as an innovation which fearfully threatens to deprive him of daily bread, but as a means of setting his mental powers comparatively free to do his quota towards the general advance of society, and to enable him to become more of a man and less of an animal than, by virtue of the superabundant calls upon his purely brute force, he is at present. Having already, in the spirit of progress with which the times are pregnant, looked forward to the probability of his hand labour becoming the work for mechanism to effect, and having, thanks to Mechanics' Institutes, and other means of diffusing knowledge, appropriated to himself a considerable share of general and practical knowledge, with a little energy he will direct himself to the manufacture or use of the machinery which was the terror of his ancestors, and pronounced by them to be the work of the devil; and soon be in a position to carry home increased wages to his family, owing to the increased demand for the article he has been accustomed to produce (or assist in producing) by hand labour.

Space will not allow us to follow the subject into its politico-economical relations. We may merely remark in closing, that if the use of machinery could be suspended, and if we could be compelled to return to the producing powers of a century since, our rank as a nation would cease; we could not maintain the forces necessary for the defence of our national existence, the interest of the money borrowed by our forefathers could not be paid, and our commerce would be very limited. Our national power and position are the result of that energy and skill which has given us machinery.

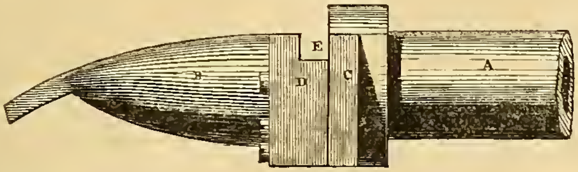
An enlarged view of this great question assures us, not only of the existence of these advantages, but enables us to fully realise the fact, that by adopting machinery generally, we are carrying out the designs of the Creator and Preserver of all things, inasmuch as we are thereby employing to the utmost His good gifts for the benefit of our fellow-creatures, and, by the saving of time, are enabled to do as much good in a life-time as our ancestors could in several generations.

SHEDDEN'S BREECH-LOADING FIRE-ARMS.

THE breech-loading gun has recently received some important modifications in its arrangement and construction at the hands of Mr. Thomas Shedden, of Ardgartan House, Arrochar, Argyllshire. This gentleman's improvements are applicable to gun barrels of the ordinary kind, as well as to those which are specially constructed for breech-loaders. In the accompanying illustrative engravings, fig. 1 represents in elevation the after portion of an ordinary gun barrel and breech, with a part of Mr.

Shedden's improvements applied to it. Fig. 2 is a similar elevation, with the breech-loading part of the barrel closed and ready for firing. Figs. 3 and 4, are vertical sections corresponding to figs. 1 and 2. The barrel, A, is cut off from the breech part, B; the upper portion of

Fig. 1.



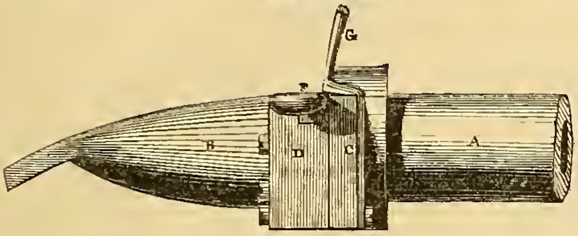
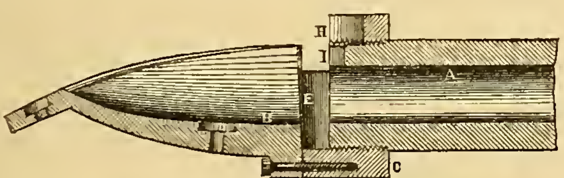


Fig. 2.

the breech is removed, so that it forms internally an open concave chamber or recess. The end of the barrel has a screw thread cut on it, to which is fitted the junction ring, C; the metal at the back part of this junction piece extends out laterally, so as to form a square face. The

Fig. 3.



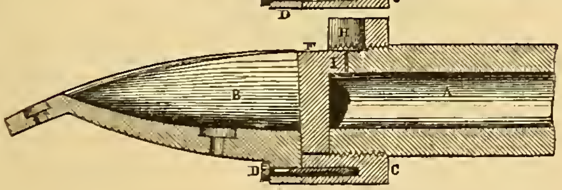


Fig. 4.

breech, B, is formed with, or has brazed or otherwise attached to it, the junction piece, D, an end view of which is shown in elevation in fig. 5, and in front view in fig 6, the back part of the breech in this figure being supposed to be removed. In this modification the parts, C, and D,

Fig. 5.

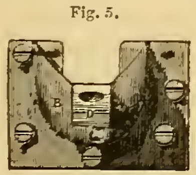
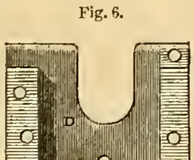


Fig. 6.



are connected together by means of screws, the breech, B, being likewise secured to the gun stock by screws passing through the chamber. When the two parts are thus connected, a transverse slot, E, is formed; this slot does not however extend completely through the junction piece, D, which on one side of the barrel comes flush up to the junction ring, C, as shown in figs. 1 and 2. The posterior face of the slot, E, is made slightly inclined towards the bottom, and the space is filled up by means of a wedge-shaped slide or shutter piece, F, which is shown closed down in fig. 2, and detached in figs. 7 and 8, which respectively represent front and end views of this part. The slide, F, is jointed at one corner to the parts, C

Fig. 7.

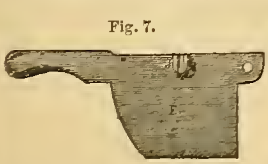


Fig. 8.

and D, by a pin which passes through the screw hole at the corner. The opposite part of the slide is carried out in a lateral direction, and forms a thumb nib for raising and depressing the slide. To prevent accidental displacement of the slide when closed, there is a spring,

Fig. 9

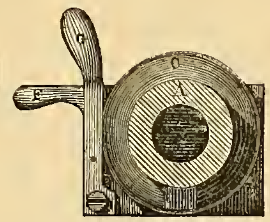
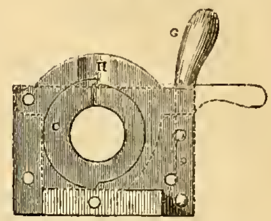
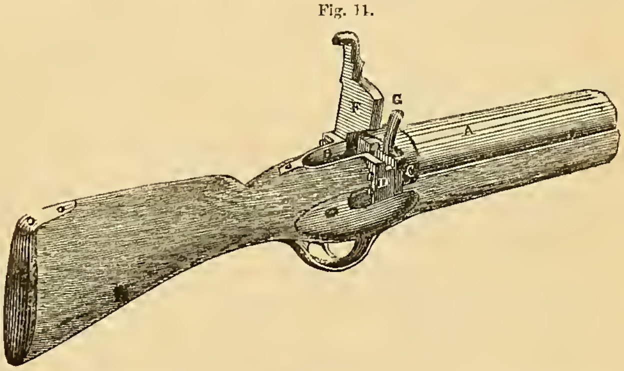


Fig. 10.



G, which is screwed to the junction ring, C; the upper part of the spring is prolonged as shown in fig. 2, and in the front and back end views; figs. 9 and 10, for the convenience of moving and replacing it as required. The general arrangement of the several parts is shown in the perspective view of the gun, with the slide, F, raised, in fig. 11. Thus upon raising the slide or shutter, F, which practically forms the extremity of the barrel, the cartridge is readily thrust forward into the barrel, by means of the cavity in the breech. And when the slide is shut down, and the spring, G, brought over its laterally projecting part, the weapon is ready for firing. The operation of loading is thus effected in a very rapid and simple manner. The junction ring, C, has a small recess, H, formed in it to admit of the end of the finger, or a suitable pointed instrument to withdraw the case of the exploded cartridge. Extending downwards from the recess, H, is a recess, I, which is filled up by a projecting part, J,

Fig. 11.



on the slide, F, when this part is shut down in its place. The projection, J, has a small tubular aperture in it to admit the pin, the striking of which by the hammer explodes the cartridge. These guns may be used with the ordinary cartridge employed in breech-loading guns, or with cartridges encased in paper, sufficiently thin to be penetrated by the flash of a percussion cap, in which case a nipple is constructed on the breech. Or the cartridges may be made with a copper tubular primer, filled with percussion powder, and fired by a blow of the hammer, in such a direction that it may not intervene in any way between the eye of the user, and the sights on the barrel. Fig. 12 is a vertical section of a gun barrel, specially constructed for this system of breech loading; fig. 13 is an elevation of the same. In this modification, the barrel, A, is formed with the projecting junction piece, C, and the breech, B, has a corresponding part, D, to admit of the slot, E, into which the slide descends as before described, the arrangement of the other parts being similar. Fig. 14 is a view looking on the face of the junction piece, C, and fig. 15, a corresponding view looking on the barrel end of the gun. The mode of charging the gun, and of removing the exploded cartridge, is in this modification the same as in the previously described arrangement. A third, and more important modifi-

Fig. 12.

Fig. 14.

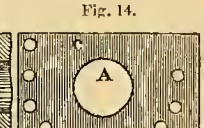


Fig. 13.

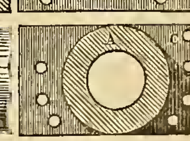


Fig. 15.

cation consists in having the breech and barrel forged in one piece, but the section and view are so similar to those in figs. 11 and 12, that there is no occasion to give a distinct engraving or description of them. The ease with which an ordinary gun or rifle may be altered to a breech-loader, is likely to cause Mr. Shedden's improvements to be extensively adopted.

SOCIETY OF ARTS EXHIBITION.

The Twelfth Annual Exhibition of inventions is now open to the public, at the rooms of the society, John Street, Adelphi. We took an early opportunity of visiting this interesting collection, and having duly entered our names, in the visitor's book — this being the only ceremonial to be gone through before admission—we spent a most agreeable and instructive hour with the models and drawings. We cannot however pretend to notice more than a tithe of the three hundred and fifty inventions here collected together, but will just draw our readers' attention to a few of the most deserving objects. To begin, in the order of the catalogue, which contains a list of upwards of two hundred exhibitors; we first notice under the head of "Engineering, mining, railway mechanism, &c."

A set of "Argand fire bars," exhibited by Messrs. Martin and Purdie, which appear admirably shaped for the admission of a plentiful supply of atmospheric air into the fuel, but we should say they would be very liable to have their air passages clogged up when in actual service, especially with a bituminous coal.

Mr. John Lee Stevens, exhibits a few of his pendulous fire bars, no doubt, well known to most of our readers by this time.

Messrs. Howell, Hick, and Hargreaves, exhibit a patent "Steam generator and smoke consumer," consisting of a simple mechanical contrivance for mixing the gases as they pass through the boiler tube on their way to the chimney, this being accomplished by placing one, two, or more fans at convenient distances apart upon a spindle carried in bearings, and extending longitudinally inside the tube; the draught of the chimney causes the several fans to rotate freely, thus producing a mechanical mixture of the gases, and rendering the heat uniform both at the centre of the boiler, and at its surface.

We noticed a drawing of Mons. Giffard's self-acting water injector, but could not find the model, although the catalogue refers to one.

Mr. A. Stewart Harrison, exhibits a simple form of marine governor for screw engines. This governor consists of a long tube, extending fore and aft the ship, and communicating with a cylinder in which works a piston in connection with the throttle valve, the weight of the piston being sufficient to close the valve by its own gravity. The tube contains mercury, which supports the weight of the piston when the ship is horizontal, or when down at the stern, but which becomes displaced on the rising of the stern, and allows the piston to descend, and so close, more or less, the throttle valve, and prevent the sudden "racing" of the engines. A modification of this apparatus is also proposed to be used in the paying out of submarine cables, for taking off the strain of the "cable breaks," when the sudden heaving up of the stern requires the cable to run out with the greatest freedom.

Mr. W. P. Wilkins, of Ipswich, exhibits an ingenious arrangement of valves for steam engines, consisting of discs placed one at each end of the cylinder, and having a continuous rotatory motion imparted to them simultaneously in the same direction. Each disc is provided with a number of ports corresponding to other ports in the ends of the cylinder. As the valve revolves once only to ten revolutions of the crank shaft, the friction and wear and tear is greatly reduced. The piston is provided on each side with projections which pass into the steam passages at the termination of each stroke, nearly up to the valve face, whereby the usual loss of steam is prevented. A stop valve, also exhibited by this gentleman, may be safely recommended for its simplicity, and for the straight and uninterrupted course it presents to the passage of the fluid.

Messrs. Guest and Chrimes are represented by a spherical seated internal loaded safety valve, a pump alarum, and a self-acting water feed for steam boilers.

Mr. Alexander Allan exhibits his last new pressure gauge, which is well worth the attention of all in charge of boilers, from its simplicity and efficiency of action. We should say it was impossible to get out of order unless destroyed, which is more than can be said of any other gauge that we have come across as yet.

One of the most ingenious contrivances in the whole exhibition is a patent pump for ships use, drainage, and ordinary purposes, invented by Mr. Hawksley, and exhibited by Mr. J. L. Norton, of Belle Sauvage Yard, Ludgate Hill. We are sorry to say that we cannot give our readers a clear notion of the simplicity of this pump without a full reference to drawings, but may briefly state that the working surfaces are self-adjusting, no packing of any kind being required, whilst the working parts can be easily got at without removing nuts, bolts, or fastenings of any kind. The piston, if *piston* it can be called, consists of a hollow rectangular oblong box or slide, working to and fro in a horizontal V-shaped open trough, having suitable stops and passages formed in the bottom thereof, the latter communicating with the suction pipe. A stop or division piece is also cast transversely in the piston, and, of course, travels with it to and fro between the fixed stops in the before mentioned V-shaped trough. The contact surfaces of the piston and trough are planed smooth, and are well lubricated so as to produce a perfectly air-tight junction; and as the moveable stop traverses to and fro between the fixed stops, the air is exhausted from the suction pipe, and the water consequently raised. An ordinary crank and connecting rod impart the required motion to the piston. We hope at a future time to present our readers with a detailed drawing and description of this really valuable invention.

Mr. Samuel Bailey, of Wood Green, Wednesbury, exhibits a large model of an apparatus for preventing accidents from overwinding in mine shafts. The essential feature of this apparatus is the employment of a pair of hooked catches, which, on overwinding taking place, are released and made to grip the edges of a fixed metal ring, supported on a strong frame between the pit's mouth and the overhead pulley. The motion which releases these catches, also releases or detaches the winding rope, and consequently the cage, instead of being carried up to the pulley, is left suspended by the hooked catches from the ring above mentioned, whilst the rope itself is carried up. This is ingenious enough in its way, but we have seen other appliances quite as simple, which we should much prefer trusting our neck to, than to this apparatus.

Mr. Matthew Leahy exhibits his patent apparatus for facilitating the draught of carriages, consisting of endless chains of rails carried by a pair of eccentric discs placed one on either side of each of the running wheels of the vehicle, the object of the eccentric discs being to take off the endless chains from the bearing wheels, and support them entirely on the peripheries of the discs, whereby a considerable portion of the strain on the joints of the chains is prevented, whilst the friction which would otherwise occur were the rails carried round the bearing wheels themselves, is also obviated.

A well-made model of a patent self-acting carriage break is exhibited by Mr. J. Biers, jun., of Kentish Town, whereby a break is instantly applied to the wheels of a vehicle by simply backing the horse, the fore carriage being made for this purpose with a slot, whereby a longitudinal, as well as the usual circular motion may be imparted to it, which longitudinal motion is made to bring a couple of break blocks into forcible contact with the peripheries of the running wheels.

A model of an ingenious double-locking carriage, which would make "cabby" open his eyes, is exhibited by Mr. Charles Seton, of Edinburgh. The fore carriage is connected by diagonal tie rods with the hind axle, which is free to lock or pivot on a centre of its own, but in a contrary direction to the fore axle. The whole of the wheels are thus compelled to move in the arc of a circle, it is true, but is any great advantage gained to compensate for the additional expense incurred?

Messrs. Saxby & Co. exhibit a neat and well-made working model, illustrating a mode of working junction signals on railways, whereby the points and signals move simultaneously by one and the same action, so that no contradictory signals can be given, as the points must correspond to the signal, whether "all right" or "danger."

Railway permanent way is largely represented by the various specimens of rails, chairs, and fastenings, contributed by Mr. Thomas Wright, whose bed-plate iron sleeper is well worthy of attention; Mr. C. W. Ramie's tumbler railway chair, wherein the rail bears upon the lower parts of two jaws or tumblers, supported by abutments on the base of the chair, and so hung that the weight of the rail or the pressure thereon causes them to grip the opposite sides of the rail firmly, in proportion to the downward pressure exerted; and Mr. Henry Lee Corlett's permanent way, which we fully illustrated and described in our last.

Under the head of "Machinery and manufacturing appliances," we noticed a capital cotton gin, exhibited by Mr. John M. Dunlop, of Manchester. It is stated that this machine will effectually clean, without injuring the fibre, from 5 to 6 lbs. of cotton per hour. The first prize of £20 was awarded to it by the "Cotton Supply Association" of Manchester.

Messrs. Newton, Wilson, & Co., of High Holborn, contribute largely in the shape of sewing machines and appliances thereof. We were much struck with the simple feed motion of the "Boudoir sewing machine," No. 64 of the catalogue, the motion being obtained entirely from the needle slide itself without the intervention of separate cams.

We were rather curious on glancing over the catalogue before our visit to see a "Pegging machine for boots and shoes," also exhibited by this firm, but found only a very rude model, on a very small scale, of which we could make nothing at all—the machine itself is supposed, however, to feed the wire, cut the pegs, bore the holes, deposit and clinch the pegs, and ought, therefore, to be a very valuable invention.

Hutton's crank shaft and connecting rod lubricator, is a simple contrivance, consisting of a brush of fine white horse hair instead of worsted or cotton—the advantages of the hair being its natural elasticity and durability. As the head of the connecting rod comes round, a cup fitted thereon scrapes against the horse hair brush, carried by a stationary oil reservoir, and receives therefrom, in passing, a small supply of oil, and conveys it to the parts to be lubricated. We should fancy, however, there would be a liability, to a certain extent, to a loss of oil by reason of the springing of the bristles, throwing or scattering the oil over the machinery. Probably this may be remedied in practice; but in the model we saw, the spring of the horse hair brush, after the passage of the cup, appeared quite sufficient to cast off and waste a considerable quantity of oil. We merely speak from the model, however, which, not being supplied with oil, we were prevented from trying the effect.

Under the head of "Naval and military appliances," we noticed a large model of a floating gridiron for raising and repairing vessels, by Mr. William Collett, Homersham. There are some features worthy of notice here, such as the facility afforded for applying the full amount of buoyant power below any given part of the vessel, as, for example, below the engine room of a steamer, as containing the greatest weight; but floating docks and pontoons, lifts and gridirons, have had the changes rung upon them to such an extent that it becomes a difficult task now-a-days to establish the identity, and point out the real and *additional* advantages, of any one in particular.

Messrs. Alexander Chaplin & Co., of Glasgow, exhibit a model of a strange-looking craft for shallow waters, provided with an apparent novelty in regard to steering apparatus, consisting of two plates, or blades, arranged so as to be taken up and let down through the bottom of the craft, at the bows, in an oblique direction, one on each side. The craft is flat-bottomed, and is devoid of keel, stem, or sternpost.

A lighthouse and pier-head lamp, exhibited by Mr. J. W. D. Brown, of Greenwich, pleased us much. This lamp consists of several tiers of lenses, the perpendicular edges of which are mitred so that they may join each other like the stones of an arch; and according to the angle at which they are mitred, a circle, or half circle of any extent, can be formed. The model shows half a circle, with two tiers of lenses.

We were much affected by a relic of poor old "Big Ben," in the shape of a large fragment of his side; it was laid upon a table alongside some "common" bells. We dropped a tear, and slowly left the spot wondering whether Mr. Dennison had visited the shrine, or if he meant to do so.

From Big Ben to crucibles is an easy transition, and we may here notice, under the head of "Philosophical apparatus," some fine specimens of plumbago crucibles and melting pots, manufactured at the Plumbago Crucible Co.'s Works, Battersea.

J. W. Silver & Co. exhibit several applications of "Ebonite" (hard rubber, we presume), amongst the most striking of which is its substitution for glass in the production of frictional electricity. It is stated to be superior to glass as two to one; but the character of its electricity is negative. Beyond its durability and capability of withstanding accidents which would infallibly smash a glass disc or cylinder, it is found to be effective in an atmosphere which would render an ordinary glass machine useless for a time.

Specimens of braided or plaited telegraph cables are exhibited by Messrs. Hall & Wells. In these cables, the outer covering is effected by a tube braiding machine, in lieu of having the strands running in a series of spirals or twists.

Mr. A. Stewart Harrison exhibits an ingenious contrivance for preventing the loss of the end in laying down submarine cables, the principle being the gripping action, produced by a number of eyes through which the cable is passed, when such eyes are caused to assume an inclined position.

Mr. Goodchild's trocheidoscope, of which we gave full particulars in our last, appeared to create considerable excitement amongst the beholders, particularly the "rising generation."

Mr. H. Hutton exhibits a useful appendage to the drawing office, in the shape of a drawing board, having a scale set into two of its edges, so that length and breadth measurements may be read off with a T square without the necessity for dividers.

Under the head of "Agricultural implements, machinery, &c.," we notice Mr. D. L. Bank's travelling suspension rail or roadway for facilitating agricultural operations. It is somewhat after the Halket system, but more efficiently carried out. The only fear we have for it, is its prime cost in laying down.

Wood's improved grass mowing machine, exhibited by Mr. W. M. Cranston, of King William Street, City, is represented by a well made working model. This machine is constructed on the reaping machine type, but without the platform, and both the running wheels act as driving wheels for the cutting mechanism.

Under the head of "Building and domestic appliances," we may draw attention to a model of a hydraulic fire-escape ladder, by Mr. Thomas Greenacre, of Millwall. Here the peculiarity consists in making the sides of the ladder telescopic, and causing them to be extended to any desired elevation, by forcing water therein by a small hand pump. The rounds of the ladder are not carried by the sides, as the telescopic nature of its construction precludes this; but are fixed into two chains, which are secured to the top of the innermost of the telescopic sides, and are wound on to a barrel at the bottom of the ladder, which pays off as much of the chain as is required whilst the sides are being elevated. The whole is of metal, and, therefore, not liable to injury from the flames of the burning building.

A very useful and simple domestic apparatus called a heat indicator, for kitchen ranges, is exhibited by Messrs. Brown and May, of North Wilts Foundry, Devizes. This little apparatus which looks more like a good old-fashioned watch than anything else, consists of a circular casing of brass, provided with a disc and indicator, and containing for works, a compound metallic bar of a semi-circular form, which when exposed to a variation in temperature expands or contracts, and through the agency of a rack and pinion, imparts a circular motion to the indicator or dial finger, which points out by numbers on the dial the degree of heat attained. By having this simple contrivance fixed into the centre of an oven door, the cook can as readily tell the temperature of her oven as she can the time of day by the kitchen clock. We feel almost disposed to moralize on this little apparatus, and fancy that we could prove in an indisputable manner that its extensive adoption in our kitchens would tend greatly to a diminution in the business of Sir Cresswell Cresswell's department, who knows (?) the sum of human (domestic) happiness is made up of trifles, we are told.

Mr. William Cowan exhibits one of Esson's compensating gas meters, which by a very simple pneumatic arrangement maintains its own water level.

We noticed some very beautiful ornamental effects produced by Messrs. Brierley and Geering's paper enamel. The specimens exhibited are pillars and other parts of iron bedsteads, covered with these ornamental papers in various degrees, which are subsequently preserved and rendered brilliant by the application of water-proof varnishes.

Mr. C. H. Hurst, exhibits a case of tap wrenches or spanners for tapping and untapping casks. The spanner and mallet may be formed in one, and so shaped as to grip the body of the tap and turn it round when required to remove it from the cask.

We have been strongly recommended for some time past by numerous advertisements to "use (if we shave,) Bailey's patent razor warmer," but we have still kept to the time-honoured jug of hot water, and still mean to do so if Mr. Bailey will permit us, although we *have* examined his no doubt invaluable apparatus exhibited here.

Amongst the miscellaneous articles, we find a very portable and effective copying-press, by Mr. Lund, of corkscrew renown. This, like many other of Mr. Lund's contrivances, is really a very useful little article, and likely to take as an appendage to the writing-desk.

Our volunteers are duly represented and provided for by Bowley and Co.'s patent knee caps, and by sundry vegetable leather gaiters from Messrs. G. Spell & Co.

Another little apparatus, which will be gratefully received in the kitchen, no doubt, is a raisin stoner, by Mr. John Algernon Clarke, of Long Sutton, Lincolnshire. This instrument greatly resembles an old-fashioned pair of snuffers both in size and shape; it performs two operations—1st, Flattening the raisin between a pair of pressing plates, so that the fruit is rendered semi-transparent, and the stones can be plainly seen; 2d, Cutting out the stones separately by a perforating punch carried in the front end of the apparatus.

Amongst the drawings, where, by the bye, we note a marked improvement in style this year, we find a large and effectively-coloured representation of Mr. R. Morrison's direct-acting steam crane, previously illustrated and described in our pages; and a well executed series of coloured drawings of Gwyn's breech-loading gun or rifle.

We have had our say, but we cannot conclude without regretting the great want of space and light which the Society has to put up with. The back part of the model room is all but in utter darkness, whilst we are also informed that very many valuable contributions to the annual exhibitions are now obliged to be declined for want of adequate accommodation. Now, this should not be. Surely an old and influential society like this can manage somehow or other to obtain more suitable premises than the musty, old-fashioned looking edifice which meets the eye on turning the corner of John Street. It is in vain to look for a steadily increasing growth in these exhibitions, for the simple reason that they are already too big for the building.

HISTORY OF THE SEWING MACHINE.

ARTICLE XXVI.

Mr. Daniel Foxwell obtained a second patent on the 29th of January, 1856, for an arrangement of sewing machine, wherein two straight needles are employed in combination with one hooked needle, one of the straight needles being made to work vertically, and the other horizontally, whilst the hook or fork also works horizontally. By another combination two needles may be used without the hook or fork, the one needle working vertically and the other horizontally. This invention also comprises a feed motion consisting of a roughened or diamond cut plate, having a lateral vibratory and lifting motion imparted to it by suitable cams or wipers, the cloth to be fed along being laid upon the roughened plate, and the whole forming a mere modification of the

Grover and Baker, or Hughes' patent feed, the principle being *identical* therewith, whilst the modifications effected are of questionable utility.

On the 13th of February, 1856, a patent was granted to Henry Fort Mitchell, William Mitchell, and John Clarkson, for a sewing machine, the feed motion of which consisted of a presser foot or plate carried by a vertical bar, and actuated by a lever, the fulcrum of which is a universal joint, so as to admit of the lever vibrating vertically as well as laterally. This lever is actuated by a suitable cam, so formed as to impart the desired vertical and horizontal motions to the lever, which are transmitted to the foot of the feeding bar, and consequently impart to it a clear quadrangular movement. A blade spring resting upon the feeding lever keeps the presser foot down upon the upper surface of the cloth. The sewing is effected by means of two needles, the one working vertically and the other horizontally beneath the table.

Joshua Homan obtained a patent for a mode of driving sewing machines, on the 3rd of March, 1856. The object of Mr. Homan's valuable (?) invention is to vary the speed or to produce a "dwell" in the action of sewing machines, when driven by a band or strap by the agency of steam or other power. In using a sewing machine it is frequently necessary in sewing round curves or turning angles to retard for a time the action of the needle or needles, and then to proceed at full speed again after the intricate part is passed. In working by steam power it has been found necessary to suddenly throw off the driving strap and so stop the machine entirely, thereby causing much delay and inconvenience. To obviate these difficulties the inventor proposes to use a loose driving strap, which will only act efficiently when tightened by a tension pulley or pulleys, brought into action by a treadle, which so long as it remains depressed will keep the strap tight and drive the machine, but when released the band will be more or less slackened, and consequently the speed will be reduced or the machine will be stopped entirely. We really cannot see that this is anything more than a very bungling contrivance for the purpose, and question much whether it would work at all in a satisfactory manner. Would not a simple friction clutch answer quite as well?

Mr. Frederick W. Thomas obtained a patent on the 27th of March, 1856, the points of his invention being, 1st. Certain peculiar means for producing an *intermittent* tension or pressure on the thread proceeding from the shuttle or other thread carrier, whether produced by pressing on the thread or on the instrument containing it. 2d. Causing the feeding foot to regulate the length of thread drawn from the bobbin. 3rd. Causing the feeding foot to regulate the tension of the thread. 4th. The use of guides formed with two guiding surfaces, to guide the two edges of the material when sewing tubular work, such as glove fingers. 5th. The use of clamps for the same purpose.

A patent was granted to Isaac Atkin and Marmaduke Miller on the 23rd of June, 1856, for a machine for running lace or other fabrics together by means of fluted or toothed rollers geared together, between which rollers the fabric is passed, and is thereby corrugated and pushed on to the needle in the form of stitches. The teeth of the rollers are grooved in order to allow of the needle resting between them. A bend or curve is formed in the hinder part of the needle, which bend is pressed on to a roller beneath by a pair of small pressing rollers; by this arrangement the needle is held stationary during the rotation of the geared rollers, whilst facility is at the same time afforded for drawing off the accumulated fabric from the needle in a continuous manner. In lieu of an ordinary eye, a barbed hook is formed on the end of the needle whereby the introduction of the thread therein is greatly facilitated. The so-called invention is identical in principle with Leonard Bostwick's machine noticed by us in our second article, the patent for which expired just two years ago!

Abraham Herts obtained provisional protection, bearing date the 12th of July, 1856, for an invention communicated to him from abroad, consisting of an improved apparatus for holding material during the operation of sewing by hand—this apparatus consisting of a pair of gripping plates, kept closed by a spring, so as to grip or hold the material placed between them. As this does not relate to mechanical sewing, we pass it by without further comment.

A patent was granted to A. V. Newton, on the 1st of October, 1856, for an invention communicated to him from abroad, consisting of the employment of a swinging ellipse as a means for throwing or actuating the shuttle of a sewing machine—this ellipse working on a point below, and operated upon by a cam on the driving or other rotating shaft, which cam so acts upon the swinging ellipse, that when it is bearing upon it near its pivot, the ellipse will move faster, or through a larger space in a given time, than when the cam is acting upon other parts; the shuttle is thus enabled to travel faster whilst going through the loop than when travelling back, thereby increasing the time for taking up the slack of each stitch, and requiring no stopping of the needle whilst the shuttle is passing through the loop. A peculiar feed motion having a vertical and horizontal action, is also described in this specification.

William Caswell Watson, of New York, obtained a patent on the 11th of October, 1856, for a single thread sewing machine, producing the old chain or tambour stitch, the improvements consisting in seizing the thread whilst in contact with the side of the needle, drawing it out, and opening it into a wide loop directly in the path of the needle at its next stroke, by the aid of a hook having a horizontal to and fro motion and a partial rotatory motion imparted to it, so as to draw out the loop and turn it from a vertical to a horizontal position, thereby forming a comparatively large opening directly in the path of the needle, and ensuring its proper entrance into the loop. The feed motion of this machine consists of an arm having a peculiarly constructed finger jointed to its lower end, pressing upon the top surface of the cloth, and placed in such a position that the vibration of the arm will cause the finger to take hold of, and move the cloth along under the needle. An inclined and grooved plate is placed beneath the cloth, so as to deflect the lower end of the needle to one side of its path, whereby its vibrations are prevented, and it is secured from breakage by the lateral pull.

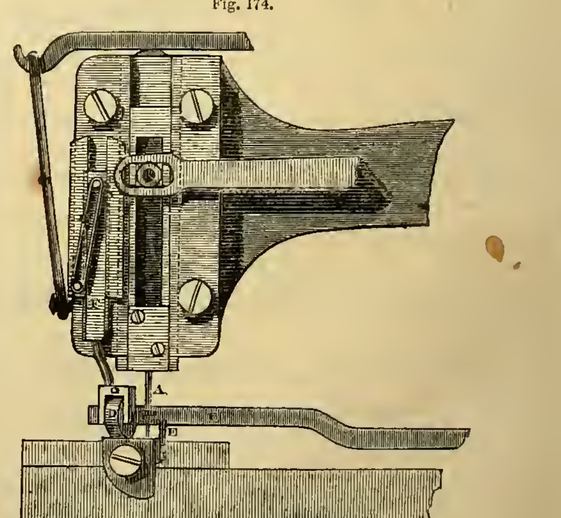
On the 11th of November, 1856, Mr. William Smith obtained a patent for certain improvements communicated to him from abroad, which improvements consist of certain modifications of, and additions to, former patents granted to that gentleman. This specification is very voluminous, and is, moreover, so very badly compiled, that no intelligible abstract can be made of it, without a more detailed and lengthy reference to drawings than we consider it worthy of. We may, however, briefly state that the principal novelties claimed are—1st, Certain peculiar semi-rotatory thread binders; 2d, a peculiar feed apparatus, combining two feeding rings or double or compound rings or feed wheels, so arranged as to hold the cloth on both sides of the needle; 3d, certain peculiar mechanism for rotating the above-mentioned feeding rings in opposite directions, and for reversing their motions when requisite; 4th, certain peculiar means whereby the cloth may be held and rotated for working eyelet holes therein.

John Crawley deposited a provisional specification of an invention on the 14th of November, 1856, wherein he described a needle and shuttle machine—the shuttle of which was proposed to be thrown or picked by the action of metal or India-rubber springs in lieu of the ordinary driver.

A patent was granted to Mons. N. P. J. Leseure, on the 15th of November, 1856, for an embroidery machine, the essential features of which we shortly recapitulate, as follows, viz., a peculiar arrangement of levers for transmitting the movements of the machine—a peculiar construction of pincers or needle grippers; a peculiar form of eccentric for working the needle, and the peculiar construction and use of a holding rod for holding the thread.

Provisional protection was granted to R. A. Brooman, on the 25th of November, 1856, for an embroidery machine, the invention of which was communicated to him from abroad. In this proposed machine, the fabric is held in a frame and moved in a vertical and horizontal direction by the aid of Jacquard mechanism and suitable pattern cards, cut to produce the pattern or design to be embroidered. Double pointed needles are used, carried in travellers, working on each side of the fabric. The threads are drawn by means of combs or notched plates, worked by levers and cams. Means are also provided for embroidering the festoon, scallop, Vandyke, or chain stitch festooning or edging.

Fig. 174.



William Henson and Henry Palmer, also obtained provisional protection on the 4th of December, 1856, for the use of moveable plates or beds for carrying the fabric, in combination with one or more needles, and arranged so as to give any simple or compound movement to the cloth, which may be requisite to produce a given direction to a set of stitches, whether straight or curved, by properly adjusting the machine before commencing to sew.

William Frederick Thomas obtained a patent, dated the 16th of December, 1856, for certain arrangements of apparatus for keeping the edges of materials to be sewn up to the guide employed in making flounces and parts of garments. The inventor proposes to use for this purpose discs or rollers, carried by axles, and placed in an oblique direction to the movement of the materials. Or in lieu of such oblique rollers or discs, instruments moving towards the guide may be employed, having motion communicated to them in such a manner as to admit of their passing back from the guide without moving back the materials. When binding the edges of articles by a sewing machine, it is proposed, according to this invention, to employ a rotatory brush, or, in lieu thereof, a reciprocating instrument, such as is used in the feed motion, by which means the binding is pressed towards the edge of the article to be bound. Fig. 174 represents a portion of a sewing machine with the first of these improvements applied, and fig. 175 is a side elevation of some of the parts separately. A, is the vertical needle worked by a lever and cam; B, the shuttle driver; C, the feeding foot; D, a roller or disc on an oblique axis, under which the fabric is moved, and by reason of its axis being set obliquely across the line in which the fabric is traversed, the roller tends to press the edge of the fabric up to or against the guide or stop, E. The frame of the roller carrying its axis, is connected with a vertical slide, F, and is pressed downwards by an India-rubber or other spring, G. When sewing two pieces of fabric together, and where the two edges are required to be pressed up towards the stops or guides opposite to each other, two rollers or discs, D, are used, as shown in fig. 176, one of them pressing upon the upper piece of fabric so as to maintain its edge against the upper stop, E, whilst the under roller presses the under fabric in the opposite direction against the under stop, E, and this is accomplished by having the axis of the two rollers set to opposite angles, the rollers being respectively pressed downwards and upwards against their respective fabrics by suitable springs for that purpose. It is obvious that ordinary feeding plates might be used in lieu of these rollers or discs, the movements of the plates being in an oblique direction as regards the course of the fabric, but this arrangement would involve the necessity for imparting an intermittent feed motion to the roughened feed plates, whereas the rollers or discs simply require to be pressed down upon the fabric. Fig 177 represents an elevation of a portion of a sewing machine, with the second of these improvements applied thereto in the form of a revolving brush, A, which by its rotation constantly presses the binding, B, smoothly under the material, C. In lieu of this rotatory brush, a reciprocating brush or instrument, having a roughened surface, may be used, and moved across the under surface of the binding when pressed up against it, in a similar manner to that described for forcing the edges of fabrics against their guiding stops.

Fig. 175.

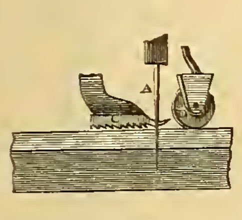


Fig. 176.

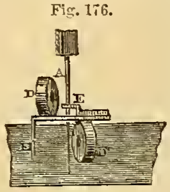
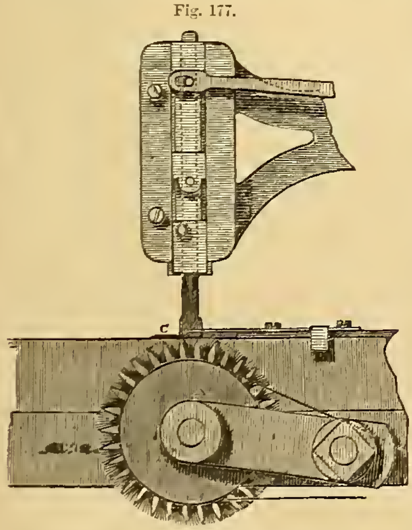


Fig. 177.



Provisional protection was allowed on the 27th of November, 1856, to W. E. Newton for an invention communicated to him from abroad, and consisting of a new stitch incapable of being ripped out, as each individual stitch is tied or knotted by throwing a shuttle and thread through a loop formed from its *own* thread. The thread is, by a peculiar needle, carried through the cloth, both upwards and downwards in the form of a loop, and one thread only is used, which is carried in a shuttle. The shuttle passes with the end of the thread through the loop; both strands, however, of the loop do not pass through the adjacent loops, as in the ordinary chain stitch, but one strand of the loop passes through one loop and the other through the next loop in succession. The needle employed is a barbed one, and the shuttle, by carrying the thread in a single strand through the loop of its *own* thread, as formed by the barbed needle, ties a knot in the thread at each stitch in such a manner that it cannot possibly be drawn out. The essential feature of this invention is stated to be the making a stitch of a *single* thread by throwing a shuttle and thread through a loop *formed from the shuttle thread* itself.

We are very sorry that this provisional protection was not proceeded with, as judging from the nature of the stitch (a firm and lasting single thread stitch) and the apparent simplicity of the machine itself, we are inclined to write it down as a valuable invention, and shall be glad to recognise it again should our researches enable us to obtain further and more detailed particulars of it.

John Henry Johnson obtained a patent on the 9th of January, 1857, for an embroidery machine, communicated from abroad. The specification of this invention is of a very voluminous nature, and the diagrams are too complicated to be given piece meal, we shall therefore content ourselves by laying before our readers briefly, the main features claimed as novel, which are—a mode of producing the required design upon the fabric, by means of blades of different lengths, which regulate the vertical and horizontal movements of the fabric frame; and certain peculiar constructions and arrangements of machinery or apparatus for preparing the patterns. The patentee claims also the general combination of the whole of the parts of his machine.

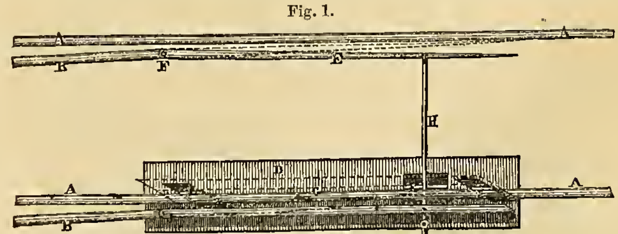
RAILWAY POINTS AND PERMANENT WAY.

By the Right Hon. the Earl of Caithness.

"Something wrong with the points." How frequently has this brief but comprehensive sentence involved all the details of a sad railway catastrophe And how frequently, we may add, might these and similar accidents have been avoided, if railway directors would but keep pace with the inventive spirit of the age. The very nature of railway property is such as to admit of improvements in the different departments being carried out on a small scale as a preliminary test before adopting them on the larger. One element of danger is the occurrence of open spaces between the points and rails, which give rise to a most unpleasant jerking of the carriages upon the train passing over the points, and in too many instances have doubtless been the cause of the carriages leaving the rails. The Earl of Caithness, whose inventive energies never seem to slumber, even amidst the pressure of official and other duties, has directed his attention to the subject of railway points, and the construction of the permanent way. The following is an abstract of the specification of his Lordship's patent, which has been recently filed.

Fig. 1 of the accompanying figures represents a plan of a portion of the permanent way of a railway constructed with the patentee's improved point or switch, which, in this view, is shown closed, so as to leave the main line closed for through traffic. A, are the rails of the main line; and B, the rails of a siding or branch line. C, is a loose length or section of rail forming a portion of the main line; and this length of rail, C, is provided with projections, c, on its underside, which projections enter into and slide freely within the parallel slots, *d*, formed in a metal plate or hollow box, D, laid in the ballast beneath the rails, and retained

Fig. 1.



in position by suitable stays or supports not shown in the engravings. These slots may be either at right angles to the main line, or they may be at an acute angle thereto; this latter mode of arranging them enabling the abutting ends of the moveable rail, C, to be bevelled, thereby forming a better junction with the ends of the main fixed rails. E, is the ordinary pointed switch rail working on a centre at F, and actuated by the lever, G, to which it is connected by the transverse connecting rod, H. This rod works freely through a longitudinal slot in the moveable rail, C, and is secured to the second switch rail, I (working on a centre at J), so that the two switch rails, E and I, will always move simultaneously. The end of the switch rail, I, is bevelled to correspond to the bevel on the

abutting end of the fixed rail, A, of the main line. A slide, K, is fitted to the underside of the switch rail, I, and a channel or groove is formed in the top of the slide, K, within which the base of the moveable rail, C, rests. On actuating the point lever, G, the switch rails, E and I, will be moved laterally, so as to open or close the main line; and with these switch rails will be carried simultaneously the moveable rail, C, in its parallel slots, such rail deriving its motion from the grooved slide, K, on which it rests. The main advantage derivable from the peculiar form of points or switches above described is, that the way is always unbroken in whatever position the points may be—that is to say, whether the points are open or shut there will be no open spaces or breaks in the rails at the crossings, the ends of the rails abutting close to each other, thereby dispensing with guide or check rails and preventing the unpleasant and dangerous shocks which usually occur in passing over points or projections.

The noble Earl's improvements in the construction of rails for railways are shown in the accompanying figures. Fig. 2 represents a compound rail composed of a T-shaped steel bar, A, with two wrought-iron L-shaped, or angled, bars, B, riveted or bolted thereto as to form an I-shaped rail with a steel wheel-bearing surface. Fig. 3 is a similar construction of rail to that shown at fig. 2; but in place of having L-shaped bars combined with the T-shaped steel rail, it is here proposed to combine therewith obtuse angled bars, B, so as to form a rail adapted to a triangular or ridge sleeper. Fig. 4 is a transverse section of an ordinary double-headed rail, having a steel plate, A, rolled on its wheel bearing surface during the process of its manufacture for the purpose of rendering such rail more durable. Old and worn rails may also be thus treated, by heating them and passing them through rolls with a steel plate on one or both of these surfaces. Fig. 5 shows the steel bearing surface, A, rolled into a longitudinal groove or channel, B, formed in the head of the rail.

Fig. 2.

Fig. 3.

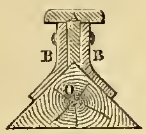
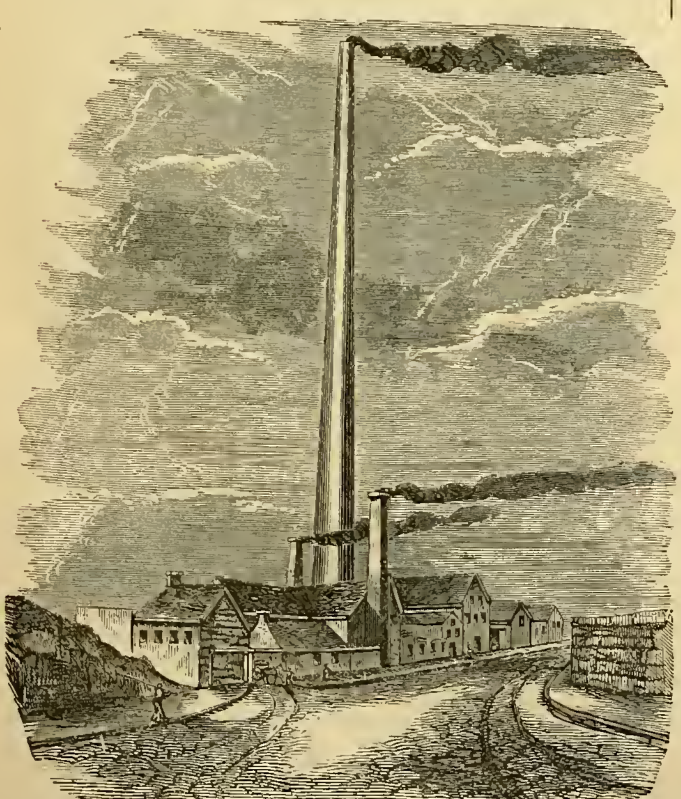


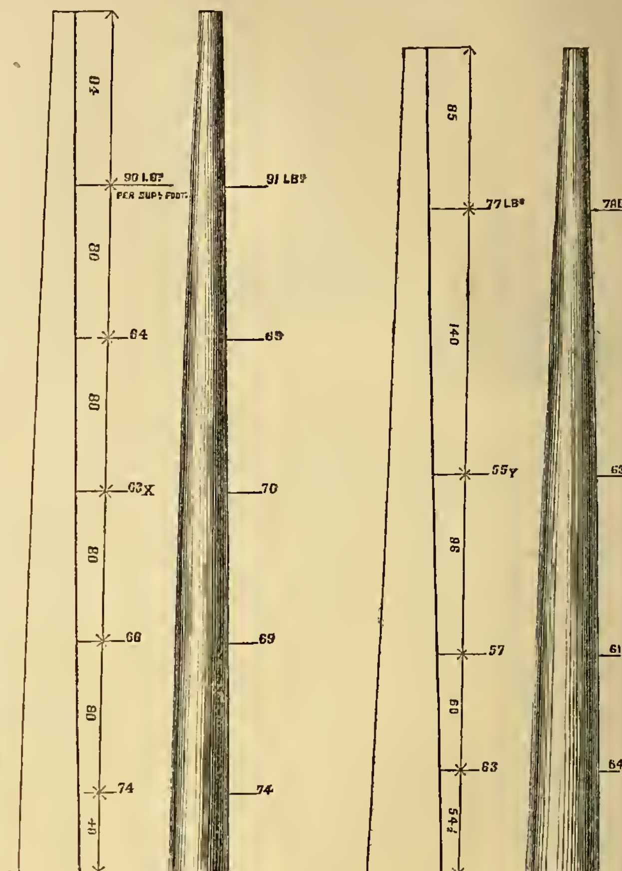
Fig. 4.

Fig. 5.

THE COLOSSAL CHIMNEY AT PORT-DUNDAS, GLASGOW.



THE lofty chimney, which our initial engraving represents, surrounded by its dwarf supplementary chimneys, and the scattered buildings of the works, has recently been completed at the chemical works of Mr. Townsend, Port-Dundas, Glasgow. Its great height—468 feet from the foundation, and 454 feet from the natural surface of the earth—has



A B

naturally caused it to be looked upon with very great interest; as well during the process of erection, as for its behaviour in the late severe storms, and the treatment which it received for the purpose of removing the bend which it had sustained. Mr. Townsend's chimney is not only the largest structure of the kind, but the loftiest building in the world, with the few exceptions of the Great Pyramid of Ghizeh, the spire of Strasburg Cathedral, and that of St. Stephen's, Vienna.

Chimneys are sometimes diminished towards the top by a concave "batter," like that at St. Rollox works, but frequently by a straight inclination, as in the present instance. The former method is preferable, from conferring a more symmetrical outline to the structure, while the latter has the advantage of being less difficult to build with accuracy, which is probably the reason it is so generally adopted; but the most substantial and pleasing form is that in which the "batter" is made slightly convex, which gives a gentle swell or bulge to the building, like a column in architecture, and imparts strength to the point where it is most required. This will be readily seen by comparing the above sketches of Port-Dundas and St. Rollox chimneys, showing their power of resistance to the pressure of the wind, in pounds per superficial foot, with two chimneys, supposed to be built in the form recommended, similar in height and diameter, the walls being diminished inside at equal distances, and to the same extent in each case. A corresponding to Port-Dundas; and B to St. Rollox chimney.

It will be observed that in both cases the strength is much increased by the convex form, particularly at the joints of least stability, x and y, an advantage more than compensating for any additional expense and trouble in building. This style of elevation, therefore may be considered the safest and most proportionate.

The plan of such edifices is made either circular, octagonal, hexagonal, or square. The last should never be adopted in chimneys of great height on account of the danger arising from the large extent of surface thereby presented to the action of the wind. Of the others, the circular plan is preferable, the effect of the wind on it being only one half of that on a square chimney of equal dimensions, while upon those of multangular form it is somewhat greater; or more accurately, if the pressure on a square chimney be taken,.................... = 1 then,

Circular,............ = 0·5
Octagonal,......... = 0·65
Hexagonal,........ = 0·75

It is also of the utmost consequence that the quality of building—both as regards the material used and the method of construction—should be carefully attended to, the failure of chimneys, in a majority of instances, being attributable to neglect of these particulars. The bricks should be hard, and of uniform size; and the mortar in the bed-joints spread as thin as possible, not more being used than is sufficient to form a level bed, and prevent lateral sliding; the strength of such buildings being in no way dependent on the adhesive power of the mortar, except within 60 or 80 feet of the top. Indeed, the compressibility of the mortar, before being hardened, is so much to be dreaded, that it might be advisable to use other substances of sufficient frictional adhesion, and of less compressible nature, to form the beds between the courses, at least up to three fourths of the height of the building. Iron rings are sometimes used to bind the walls, either outside or concealed within the outer surface of the brickwork; but the practice is not to be recommended, as it involves an increase in the expense of the erection without adding to its security, experience having shown that iron rings so employed are without effect in preventing the failure of chimneys otherwise defective in construction. In fact, well built chimneys require no iron rings; and those that are improperly constructed are not saved by them. Hoop-iron, however, is useful, being the most advantageous form in which that material can be employed in building: and when laid in sufficient quantity in the horizontal joints, is very efficacious in preventing cracks taking place in the walls.

The foundations of this chimney are of a most complete and substantial description, being laid 14 feet below the surface on a bed of hard stiff clay, mixed with pebbles, and consisting, first, of 6 courses of brick on edge covering a circular area 47 feet in diameter, diminished by outside "searcements" to a diameter of 44 feet. Over this solid substratum, the foundations proper consist of 26 courses of brick, also on edge, diminished by "searcements" on both sides from 21 feet 9 inches to 8 feet 6 inches thick. At the surface, the outside diameter is 32 feet, with walls 5 feet 3 inches thick, and an inside lining of fire-brick carried up 50 feet. At the cope, the outside diameter is 12 feet 8 inches, with 14 inch walls, the height from the surface being 454 feet, and the total height of the building 468 feet. The foundations were commenced in May, 1857, and 50 feet of the superstructure built by September.

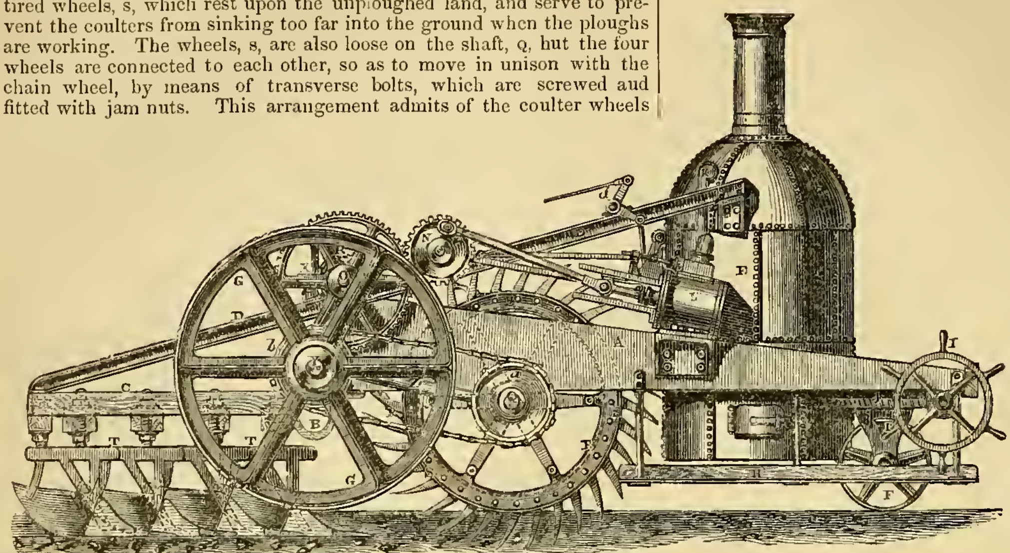
From June to October 1858, 180 feet were added to the building, leaving 224 feet to be built during the following summer. Unfortunately, the work was not resumed till the middle of June, in consequence of unavoidable delay in bringing forward the material; after which, it was hurried up with a rapidity inconsistent with security, to which circumstance the subsequent failure of the building is attributable. It is proper to state here, that the builder, Mr. Corbet, is free of any imputation of blame or responsibility for the results which followed, having, on the contrary, executed his work throughout in a most creditable and satisfactory manner. When the violent storm of 9th September occurred, the chimney, then nearly completed, was in a very unfavourable state to resist it—the mortar in the newly-built portion of the work being quite soft, and even that of the work of last year not having acquired much hardness in the interior of the walls. A deflection towards the east, to the extent of 7 feet 9 inches consequently took place, in which state the structure remained until its restoration by sawing was commenced on the 21st September, the interior framework of the timber supporting the scaffolds having been slackened in the interval. In the operations then undertaken, it was considered prudent to saw only one course at a time, lest the occurrence of any shock might crack or otherwise injure the brickwork. The sawing was performed from inside scaffolding by means of single-handled saws; and although somewhat tedious in the thick walls, was not generally attended with any difficulty. A portion of the brickwork, in some cases 14 inches thick, was removed from the interior of the part intended to be sawn to the extent of about one half of the circumference; and by means of chisels one or more openings were made on the windward side of the chimney, through which the saws were inserted, and worked in opposite directions towards the leeward side, the vacant interior space being filled up with new bricks and mortar as the sawing proceeded. In each incision, a bed of uniform surface, and of sufficient adhesion to prevent lateral sliding, was formed by moistening the mortar with water during the sawing. Considerable difficulty was sometimes experienced in withdrawing the saws on the settling of the superincumbent weight, which generally took place when one half of the circumference had been cut through particularly in the lower incisions where the weight was greatest. In cases of this kind, the general rule is to begin at the lowest cut and proceed in regular succession to the highest; but in the present instance, this order was not attended to, nor does it seem of any consequence, the desired result having been obtained by making each cut in the position considered most advisable, judging from the effect produced by former incisions. On the first of October, the axis of the chimney was brought truly vertical, to effect which only twelve cuts were necessary. The sawing process was ably carried out, under the superintendence of Mr. D. Macfarlane, the architect, who has since issued a very interesting report upon the chimney.

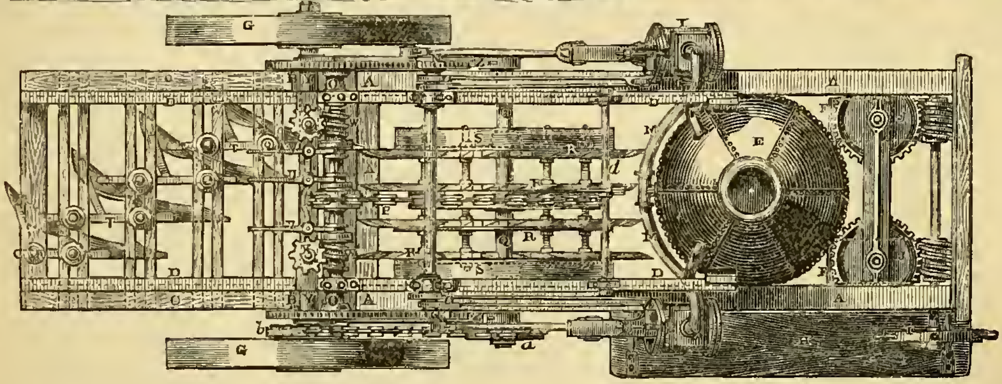
It seems to be quite clear that the deflection arose, not from defective workmanship or materials, but from the very high wind following immediately on the completion of the upper 224 feet, which had all been built in the comparatively short period of 90 days, and of which the mortar could not have had time to set properly. A million and a half bricks were used in the building; the weight of which is 8,000 tons. The cost was £8,000, the chimney is now perfectly straight, and Mr. Townsend, as well as Mr. Macfarlane, may be congratulated on having built and completed a structure which is so great an ornament to manufacturing Glasgow, and which is now proved to be so safe and enduring.

HUNTER'S STEAM PLOUGHING MACHINE.

One of the latest productions in the way of cultivating land by means of steam power, is delineated in the subjoined illustrations. These figures represent the new steam ploughing and cultivating implement, the invention of Mr James Hunter, of Kilmahumaig, near Lochgilphead, Argyllshire. This gentleman has, we think, succeeded in producing an implement which will prove entirely successful in agricultural operations. Mr. Hunter's cultivating machine, is adapted for making its way across a field as readily as an ordinary locomotive or traction engine, whilst its arrangement admits of its being applied to many useful purposes besides ploughing.

Fig. 1 of the accompanying engravings is a longitudinal elevation, showing one modification of the improved ploughing machine; and fig. 2 is a plan corresponding. The framing of the machine consists of the two parallel main beams, A, connected behind by a similar transverse beam, which is indicated by dotted lines in fig. 2, which may be formed of wood or iron, but are, by preference, made of boiler plate, so as to form a hollow rectangular receptacle on each side of the machine. These hollow beams serve as tanks for holding a supply of water for the engine. Extending out behind the beams, A, and connected thereto by the downwardly curved bracket pieces, B, is the wood framing, C, in which the ploughshares are arranged. From the backward end of the framing, C, the two angular stays, D, extend towards the front part of the machine, where their extremities are bolted to the boiler, E. The machine is supported at the front part on the two bearing and guiding wheels, F, and at the after part, when the ploughs are not in action, upon the driving and bearing wheels, G. All these wheels are made with broad tires, to prevent them from sinking into the ground, and if necessary their peripheries may be made with transverse projecting ribs, for the purpose of taking a firm hold on the ground, and of assisting the progression. At the front part of the machine, and pendent from the side beam is the platform, H, on which the attendant who has charge of the steering wheel, I, stands. This wheel is fast to a transverse shaft, carrying the worms which gear with the worm wheels, J, the spindles of which pass through discs, and are carried in a transverse beam, extending between the side beams, A. To the lower faces of the worm wheels, J, are bolted, or otherwise secured, the brackets, which carry the guiding and bearing wheels, F. Thus, as the attendant causes the worm wheels to rotate upon their axes, the wheels, F, are moved either to the right or left, and the machine is caused to turn in a corresponding direction. Above the front end of the framing, but not shown in the engravings, is built a receptacle for coal or coke, so that the attendant is enabled to attend to the stoking of the furnace, as well as the guiding of the machine. The boiler, E, is, by preference, of the vertical tubular class, the furnace being arranged in the lower part, the smoke and products of combustion passing through the tubes in the body of the boiler and away by the funnel. The steam is conveyed by the laterally branching pipes, K, to the valve chests, and the used steam passes from the cylinders, L, into the pipe, M, and from thence escapes into the smoke box of the boiler. The cylinders are bolted down to overhanging brackets, which are attached to the side beams, A; they are arranged in an angular position with the valve chests on their upper parts. The outer extremity of each piston, rod forms a cross head, which works in a guide, which is bolted to the cylinder cover and side beams, A. Each piston-rod is connected by a rod to the disc crank, N, keyed to the end of the driving shaft; this shaft is carried in bearings, which are bolted to the stays, D. The peripheries of the disc cranks are toothed, and they gear with the spur wheels, which are fast to the transverse shaft, O, the bearings of which are carried by the stays, D. At the centre of the shaft, O, is fitted a chain wheel, which by means of the chain, P, gives motion to the large chain wheel on the shaft, Q, this shaft being carried in bearings pendent from the under sides of the beams, A. On the shaft, Q, are arranged a series of four discs or wheels, to which coulter blades or tines, R, are attached, and which are disposed parallel to each other. One set of the coulter blades is bolted either in pairs or otherwise, so as to be readily detached when required for the purposes of renewal or repair, to the side of the chain wheel, which is keyed to the shaft, O, and the contiguous set on the left hand side to a wheel, running loosely on the shaft, O. The two outer sets of rotatory coulters are bolted to the broad tired wheels, S, which rest upon the unploughed land, and serve to prevent the coulters from sinking too far into the ground when the ploughs are working. The wheels, S, are also loose on the shaft, Q, but the four wheels are connected to each other, so as to move in unison with the chain wheel, by means of transverse bolts, which are screwed and fitted with jam nuts. This arrangement admits of the coulter wheels





being adjusted to the width of the furrow required to be cut, and they are placed so as to be in a line with the front extremities of the ploughs. When the machine is employed in tilling, the blades of the four rotatory coulters are by its weight caused to descend into the ground in a vertical direction, thus offering the least possible obstruction to the onward progress, and so cut the land into a corresponding number of slices, which are afterwards turned over by the action of the ploughs. As the coulter wheels slowly rotate, the curved steel pointed blades or tines successively penetrate the earth and take hold of it, and in this manner the machine is propelled along the ground, the bearing wheels, G, being meanwhile raised, as will be presently described. In this modification of the machine there are four ploughs, capable of adjustment as regards their distance asunder, and arranged one in advance of the other, but any other suitable number may be adopted. Across the end frame, C, are fitted eight bars of timber or iron, which are arranged in pairs contiguous to each other, forming four transverse slots extending across the plough frame. In the slots so formed are arranged vertical bolts, which are screwed throughout their length; they are supported on the cross bars by broad flanged nuts, and are fixed in position by jam nuts. The lower extremities of the screw bolts, *e*, are secured to the stay frames, T, to which the ploughshares are attached. The upper part of each stay frame extends backward to admit of its being attached by a second screw bolt to the cross bars of the frame, C. The triangular pendent part at the front of each stay frame, T, is firmly attached to the side of each of the ploughshares, and the back part of the mould board is in like manner secured to the laterally projecting stay of the frame. In this way a rigid and immoveable attachment of the ploughs to the frame, C, is obtained; at the same time the arrangement of the screw bolts and jaw nuts admit of the ploughs being readily adjusted, either vertically or laterally, so as to obtain the required depth and width of furrow. The engineer in charge of the engine stands upon a platform arranged above the plough frame, C, but not shown in the engravings. Immediately in front of him is the hand lever, U, by means of which, and the coupling, the chain wheel is put into or out of gear with the shaft, O. Parallel to the hand lever, U, and centred upon the same cross piece, are two other hand levers, V, which actuate the couplings on the shaft, O; these couplings impart motion to the worms, W, which otherwise run loosely on the shaft. The worms, W, gear with the worm wheels, through the centre of which the vertical screws, X, work; the worm wheels are carried in bosses which are affixed to and project inwards from the stays, D. The lower ends of the screws, X, are fast to bosses carried on the shaft, Y, on the extremities of which the bearing wheels, G, are fitted. It is preferred to have one of these wheels loose on the shaft, the other being keyed thereto acts as a fly wheel during the tilling operations, and a driving wheel when the machine is required to be turned round or moved from place to place. The machine is represented with the bearing wheels raised off the ground; when it is required to lower these wheels and withdraw the tilling implements, the engineer couples the worms, W, with the shaft, O. The worm wheels being thus put in motion, the screws, X, are caused to descend, carrying with them the shaft, Y, and the bearing wheels, G, the curved bracket pieces, B, admitting of this vertical traverse of the shaft. The continued rotation of the worm wheels in the fixed bosses on the framing, after the bearing wheels, G, are resting on the ground, has the effect of raising the after part of the machine, and so lifting the implements, coulter wheels, as well as ploughs, clear of the ground. While this operation is being effected, and when the tilling implements are not in use, the chain wheel on the shaft, O, is thrown out of gear by means of the hand lever and coupling, U. On the extremities of the shaft, Q, are keyed two rods, Z, which connect it to the shaft, Y, of the driving wheels, G, the shaft turning in bosses at the end of the rods; and outside one of these connecting rods is a chain wheel, *a*, the motion of which is communicated by the chain, *b*, to the chain wheel on the boss of the driving wheel, G. The slide valves of the engines are worked by the eccentrics, *c*, on the driving shaft, the rods of which extend forward to the link motion, which is connected to the spindles of the slide valves. The motion of the engine is reversed by means of a hand lever, which is connected to the transverse shaft, *d*, each extremity of this shaft is connected by means of a lever and link with the link motion. When the tilling implements are to be brought into operation, the screws, *o*, are raised so as to lift the wheels, G, off the ground and allow the frame, A, to descend, the principal weight of the machine then rests upon the rotatory coulters. Upon the coulters being put in motion the superincumbent weight facilitates their descent into the earth; and as the machine is impelled forward, the land is cut into strips, which is then undercut and turned over by the ploughs following in the rear of the coulters. The utility of this machine may be extended by substituting for the common ploughs, grubber teeth, scarifiers, trenching ploughs, or other implements of a generally similar kind; the power of the engine may also, with trifling modifications, be applied to other useful purposes connected with agricultural operations, than that of ploughing. With these several improvements in the steam ploughing or cultivating machine, its construction is greatly simplified, and its management rendered as easy as that of an ordinary agricultural engine; at the same time, all secondary or supplementary adjuncts for assisting the operations of the machine are dispensed with. The actual cultivating details are evidently so contrived as to break up and disintegrate the soil in the most perfect manner, and we think the machine will be at once recognized as a really satisfactory contribution to the mechanism of the farm.

RECENT PATENTS.

MOULDING RAILWAY CHAIRS.

M. A. Muir *and* James M'Ilwham, *Glasgow—Patent dated March* 26, 1859.

The unwearied vigilance displayed by Messrs. Muir and M'Ilwham, in conceiving and carrying out improvements in the several branches of their business, has placed the Anderston Foundry firm foremost in carrying out the gigantic contracts for the Indian and other railways, which are now being constructed under the superintendence of our engineers abroad. The invention to which we have now to direct attention, is an elaboration of the system of moulding, described by us in the *Journals* for September and October, 1857; the object of the present invention being the simplifying of the moulding operation, as well as a saving of time and skilled labour.

Fig. 1 is an elevation of the chair-moulding apparatus looking towards it from the position where the moulder stands; fig. 2 is a partially sectional side elevation. In moulding railway chairs according to this system, the moulder stands in a recess, A, which is sunk below the ordinary level of the moulding floor, so that the mould box is at a convenient height for ramming up. The sunk part, A, is partly surrounded by the raised edge, B, which prevents the sand from falling into the recess; the partially enclosed space, C, is used as a receptacle for the finer kind of moulding sand for moulding the upper parts and sharp edges of the chair. The working platform on which the filling up of the drag part of the mould takes place has partially sunk below it a rectangular box, D, which is kept in a heated state by means of hot scrap iron and "blackening." The top of the box is open and the scrap iron and "blackening" are filled in up to the top, so as to impart a moderate degree of heat to the pattern and plate. The pattern plate, E, is of wrought iron, with the pair of chair patterns arranged upon it parallel to one another. The pattern plate, E, is made with an upwardly projecting swell or thickness piece at each end, which part has a slot made in it to admit of the self-acting catch, F, working therein, the catch being retained by a pin passed through the sides of the slot and the catch The upper part of each of these catches is formed into a hook, and the lower part being weighted, each forms a species of pendulous tumbling catch, the weighted end causing it to take hold of and release itself from the mould box in a self-acting manner. The "drag" or lower part of the moulding box, G, is made with a laterally projecting centre stud or trunnion at each end, and when the moulder and his assistant place the lower part of the moulding box on the plate, E, which has been previously placed on the box, D, the trunnions of the "drag," coming in contact with the catches, F, slide over the inclined surfaces of the upper part of the catches, and so cause them to fall back a little to allow of the drag coming down fairly upon the plate, E. No sooner are the trunnions clear of the hooks of the catches, F, than the weighted ends bring them back to their former position, so that the lower inclined surfaces of the hooks now slide over the trunnions, and thus connect the drag, G, and the plate, E, firmly to each other. The moulder now puts a little of the fine sand into the box and presses it into the cavities of the pattern, the brass slip pieces for moulding the overhanging parts of the jaws having been previously put in. The assistant then shovels in the sand, the moulder meanwhile ramming it down to form the required compact mass. When the "drag" is properly rammed up the moulder's assistant puts on the plate, H, which is a perforated plate of cast-iron having the inclined catches, I, projecting from its under surface, these catches slip over corresponding projecting inclines on the drag, G, and thus the two are locked together. The lower part of the moulding box is now ready to be inverted in order to remove the plate, E, and so withdraw the pattern from the sand; this operation is done at that part of the moulding floor a little to the right or left of the moulder, but immediately contiguous to the heating box, D. The lower part of the moulding box with the pattern is removed by means of an overhead traversing sling. To the wall, J, is bolted the two brackets, K, which support at their outer extremities the transverse rail, L, which is secured thereto by a bolt and nut passed through a slot in the upwardly turned end of each bracket, thus giving the means of adjusting the rail to the exact height required. Upon this rail, L, the pulley, M. traverses to and fro, the traverse away from the box, D, being regulated by the adjustable stop, N. To the strap of the pulley, M, is jointed the pendent rod, O; the lower end of this rod is connected by a pin and cotter to the hand lever, P, the outer extremity of which carries the open frame or sling, Q. The pendent arms of the sling are made sufficiently wide to take in the moulding box, G, and the lower extremities of these arms have an inwardly projecting part which is recessed so as to form a hook to receive the ends of the trunnions on the moulding box, and so sustain it.

Fig. 1.

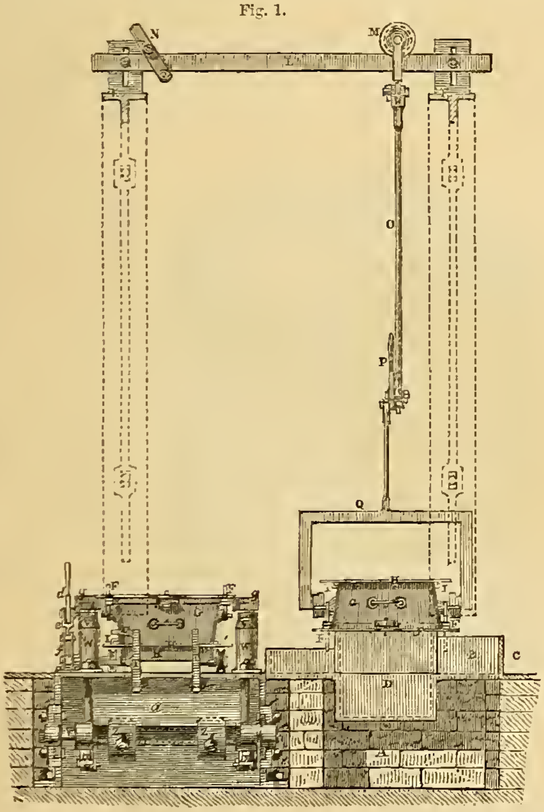
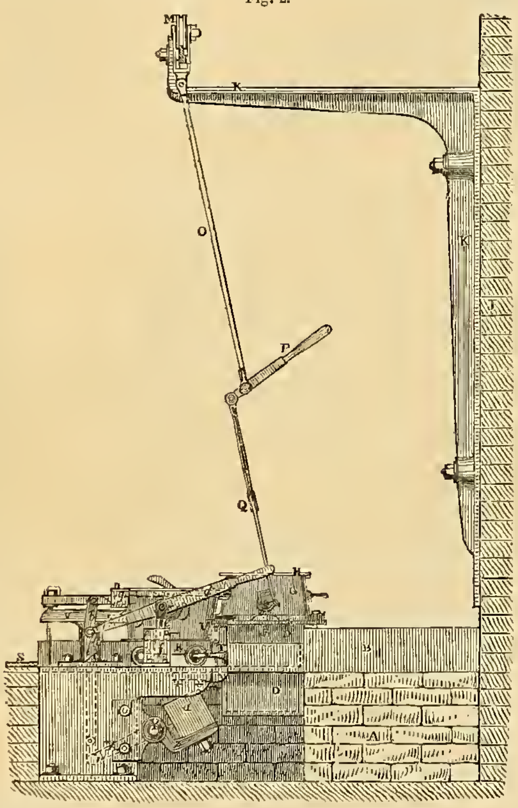


Fig. 2.



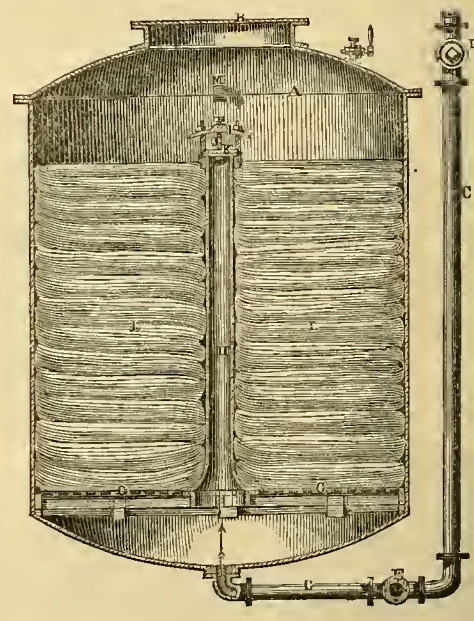
The arrangement of the hand lever, P, admits of the moulder bringing the recessed ends of the arms under the trunnions, for by thrusting up the hand lever, so as to place it nearly in a vertical position, the outer end is thereby lowered sufficiently to bring the hooked ends of the sling under the trunnions of the moulding box. By reversing the position of the hand lever, the box, G, and plate, E, are swung clear of the heater, D, and the box is then inverted, and is passed rapidly to the right or left, the whole swinging freely in the sling, Q. The box, G, when inverted by the moulder, or his assistant, brings the plate, H, underneath, the moulder then raises the hand lever, and so lowers the mould box on to the carriage, R, which has been previously wheeled up to receive it. It may here be observed, that the part of the moulding platform where the heating box, D, is arranged, is nearer to the wall, J, than the adjoining part where the carriage, R, stands; this arrangement is made with a view of saving labour. For when the mould box, G, is to be removed from the heating box, D, the moulder draws the sling towards him to the position shown in fig. 2, so that when the box and plate are clear of the heater, the moulder allows it to swing outwards, to bring the rod, O, and sling, Q, in a vertical position, when a simple movement to the left carries it at once over the carriage, R. The mould carriages, R, consist of an open rectangular frame of wrought iron, having laterally projecting studs bolted thereto which carry four small grooved wheels; these carriages run in between the guide rails, S, which serve to keep them in line to receive the molten metal when ready. In wheeling up the empty carriage to receive the mould box, G, the front part comes against the two vertical stops, T, which are bolted to the moulding platform. One of these stops has two laterally projecting bent arms, U, the lower one of which serves to adjust the carriage in a lateral direction, whilst the stops, T, stay its progress in a forward direction. The upper arm, U, serves to guide the moulder in placing the box, G, on the carriage, for he has nothing more to do than to bring the box, G, up against this stop to ensure its being placed accurately upon the carriage. The hand lever, P, being elevated so as to lower the box upon the carriage, the sling is released from the trunnions of the box, G; the sling is then pushed to the right and hooked back out of the way, and in readiness for removing the next mould and pattern. The moulder now pushes the mould box and carriage away from him a little, so as to bring them between the vertical traversing spindles, V. These spindles are made with broad T-heads on which the extremities of the pattern plate, E, rest when the raising of the plate is effected; the vertical stem of each spindle passes through the vertical guides, W, which are bolted down to the platform, their upper extremities being made of a T-shaped figure, as shown in fig. 2 of the accompanying engravings. The lower ends of the traversing spindles, V, are jointed to a pair of levers, X, which are fast to the horizontal rocking shaft, Y, its journals being carried in bearings that are bolted to the side pieces of the moulding platform. The shaft, Y, also carries the two outwardly extending levers, Z, to which is bolted the counterweight, 1, which is made sufficiently heavy to balance the weight of the spindles and their connected parts, as well as the pattern plate when resting upon the T-heads of the spindles. At the centre of one of the spindle T-heads is a laterally projecting stud which carries the pendent link, 2, the lower end of which forms a catch or hook in immediate contiguity to the stud, 3, which projects outwards from the face of the spindle guide, W. The hook of the link, 2, is caused to catch or be released at pleasure from the stud, 3, by means of the long hand lever, 4, the backward end of which is jointed near to the centre of the link, 2, whilst the front end extends to within convenient reach of the moulder. This hand lever, 4, is connected at about the middle of its length to a pendent link, 5, which passes down between the sides of the vertical guide, 6, the lower end of the link working on a pin passed through the parallel plates of the guide, 6. A pin passed through the guide plates at the upper corners serve as stops to check the motion of the link, 5, to and fro, so that the moulder by setting the hand lever back is enabled to release the hook of the link, 2, and by pressing more or less on the lever to adjust and temper the rise of the spindles when carrying the pattern plate. When the carriage and mould box is pushed forward by the moulder, its course in that direction is checked by the two end stops, 7; these stops are prolonged downwards, and pass through the ends of the T-headed guides, W, serving to steady the spindles in their upward traverse. Any lateral deviation of the pattern plate is prevented by the guide pieces, 8, the inclined surfaces of which direct the carriage fairly between the lifting spindles, V. The moulder now strikes the face of the pattern plate, E, in order to loosen the sand from the plate, and aid the withdrawal of the pattern, and this action causes the tumbling catches, F, to release themselves from the trunnions of the mould box, G, by the overbalancing of the weighted ends. Almost simultaneously with the striking action, the moulder disengages the hook, 2, by means of the hand lever, 4; the spindle, V, being now liberated, the weight, 1, causes them to ascend, the motion is meanwhile regulated by the moulder, who keeps his hand upon the lever, 4. In this way the pattern and plate, E, is steadily and evenly lifted out of the sand, leaving the moulded impression perfectly sharp therein. The moulder's assistant now turns over the pattern plate, and it is removed to the heating box ready to receive another mould box, G, the moulder meanwhile lowers the spindles, V, to their normal position, and returns to his place in front of the heating box. A boy, by means of a hooked hand rod draws away the completed "drag" of the mould and runs it between the line of rails, in readiness to receive its top box, he also runs an empty carriage up to receive the next mould box. The top plate is rammed up in the usual manner on a pedestal or stand, alongside which the carriages are run in the rails; as these boxes are rammed, they are lifted off and placed on the drag part of the mould. The plate on which the top box is placed to fill it with sand, has four oval convex cavities formed in it, which form corresponding projections on the sand, and when the metal is poured into the mould, they leave two cavities in the sole of each chair. A raised print or core is also formed on the plate, which hollows out a horizontal passage in the sand for the molten metal to flow along; the gate pattern, which forms the vertical tubular passage in the sand, is inserted in the hole at the end of the core. The top box is then rammed up, the gate pattern is taken out, and the box is removed to the lower mould box; these completed moulds being arranged in lines between the guide rails, the molten metal is brought along in ladles or metal holders supported upon a carriage and is poured into the moulds in succession. When the metal has solidified, the castings are turned out, and when cold are trimmed off in the usual way, which completes the operation of manufacturing railway chairs upon this system.

BLEACHING TEXTILE FABRICS.

RICHARD KAY, *Busby,—Patent dated September* 28, 1859.

BY means of a valvular apparatus applied to the central vertical pipe of bleaching kiers, Mr. Kay has succeeded in greatly improving the bleaching process. The goods bleached with the aid of these improvements are superior in point of appearance, and an important saving in time is also effected. In addition to these advantages, which are by no means trivial, the valvular arrangement may be applied to all ordinary kiers or bleaching pots, at a comparatively small expense.

The accompanying figure is a partially sectional elevation of one modification of the apparatus, for preparing and bleaching textile fabrics and materials. The vessel, A, in which the bleaching operation is effected is the ordinary iron "kier," which is of a cylindrical figure, the ends are convex, the upper part having an opening for affording access to the interior of the kier. The opening at the upper part of the kier is closed during the bleaching operation by means of the cover, B. At the lower part of the kier the pipe, C, enters; this pipe is connected to the vertical steam pipe, the passage of which is controlled by the cock, D. Branching off from the pipe, C, in a lateral direction is a secondary pipe, E, which has fitted to it the cock, F; the branched pipe thus serves the



two purposes of conveying steam to the interior of the kier, and of carrying off the used or impure bleaching liquor therefrom. At the lower part of the kier is fitted the false bottom, G, this is made of cast-iron in two parts, which fit the cylindrical portion of the kier, and rest upon short feet cast on the under sides. The false bottom, G, has rectangular or other shaped openings formed in it, to admit of the passage of the steam and bleaching liquor through it, a large aperture being also left at the centre, to the margin of which is bolted the pipe, H. The pipe, H, is of a conical figure at the lower end, above which part it is cylindrical; the pipe extends upwards nearly to the top of the kier, and above the height to which the piece goods are placed therein. Above the pipe, H, is arranged the concave cap or spreader, I, which is supported upon short screwed uprights, fitted into snugs cast on the exterior of the pipe, H. Through the centre of the cap, I, there is passed a screwed spindle, J, the lower end of which is attached to the valve, K; the upper end of the valve spindle is fitted with a hand wheel, or is made square to receive a box-ended key, by means of which the valve is raised from or screwed down upon its seat. The goods, after being passed through the washing machine, are run through a quantity of liquor into the kier in the usual manner, the several pieces being in consecutive layers around the central pipe, H, until the pile of goods, L, reaches the desired height in the kier. The cover, B, of the kier is placed on, and the valve, K, is screwed down so as to close the upper end of the pipe, H. The steam is now turned on by the cock, D, so as to pass down the pipe, C, and upwards through the false bottom, G, permeating and moistening the goods in its upward progress. When the goods have been thoroughly saturated in this manner the steam is turned off, the cover, B, is lifted off, and the valve, K, is raised by means of its key or hand wheel, the cover is replaced and the goods are ready to receive the bleaching liquor. Contiguous to the kier, H, is arranged a "back" or reservoir for holding a supply of the bleaching liquor, which may consist of a solution of caustic soda or other chemical ingredient, according to the nature of the goods or materials to be operated upon. The bleaching liquor is supplied to the back by a pipe, and the contents of the back are kept up to the boiling temperature by means of steam. The boiling liquor is conveyed into the kier by means of a pipe, the passage of which is controlled by a cock or valve. A sufficient quantity of bleaching liquor is run into the kier to cover the goods or materials, the air within the kier being allowed to escape by means of a cock, fitted in the curved part of the cover. The supply of bleaching liquor is now shut off and the steam turned on, by which means the boiling of the bleaching liquor is immediately renewed. The boiling liquor now flows up the pipe, H, and impinges forcibly against the valve, K, and the cap, I, so as to be scattered in a shower over the surface of the goods or textile materials. As the liquor percolates through the goods, it descends through the false bottom, to be again carried up the pipe, H, and in this way a constant circulation of the boiling liquor is carried on. After boiling a sufficient length of time the steam is turned off, and the liquor is run off by the pipe, E; upon the cover, B, being removed, the goods are ready for being taken out of the kier. The bleaching liquor may either be returned to the back if fit to use again, or allowed to run to waste. In this manner goods or textile materials may be bleached with superior effect and economy, at the same time the system of operation ensures the goods being properly and most effectively subjected to the action of the bleaching liquor, and so prevents the discolouration of the upper pieces, which commonly occurs with the ordinary apparatus.

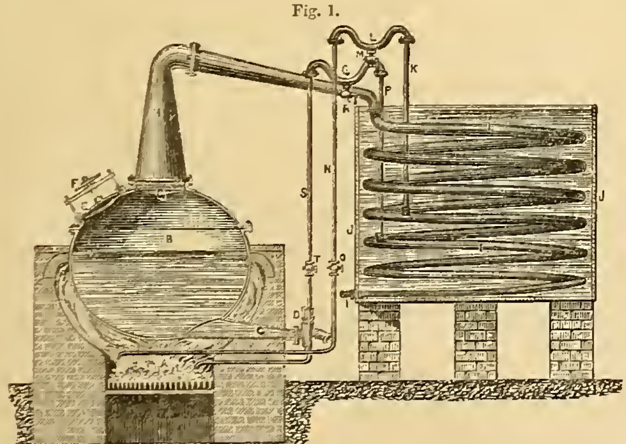
PREPARATION OF ROSIN OIL.

ALEX. MACKENZIE FERRY, *Edinburgh.—Patent dated October* 6, 1859.

THE improvements in treating rosin, and in obtaining therefrom a fine pure oil, adapted for illuminating purposes, as carried out under Mr. Ferry's patent, places at the public disposal a cheap agent for obtaining artificial light. The specification of the letters patent also comprehends a lamp, which is specially adapted for producing the full illuminating effect from the refined rosin oil.

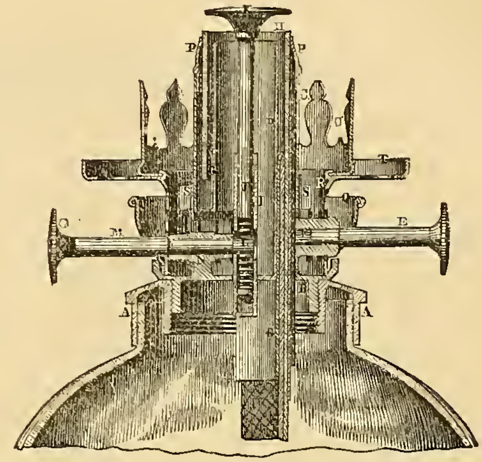
Fig. 1 of our illustrative engravings is a partially sectional elevation of the apparatus for preparing rosin oil. The apparatus consists of a brick built furnace, A, in which is arranged the oblate spheroidal still, B. The furnace is built so that the flame of the burning fuel and heated products of combustion pass completely round the still or retort, B. The still is by preference made of iron, it is formed in two parts, which are secured together by bolts passing through the laterally projecting flanges. From the lower part of the still, a horizontal pipe, C, projects out through the brick work of the furnace, this pipe terminates in a cock, D, and serves to draw off the refuse matters from the still. The

Fig. 1.



charging of the still is effected through the aperture or man hole, which is made in the side at the upper part, this opening is closed by means of the usual moveable plate, E, which is screwed tightly down by the hand wheel, F. Across the opening in the upper part of the still, through which the vapours arising from the heated rosin ascend, is fitted a diaphragm of wire gauze, or perforated zinc, G. To the flange of the still, immediately above this opening is bolted the hood, H, which is continued upwards for some distance in a vertical direction, and then branches off at right angles. The head of the still is connected by

Fig. 2.



means of a downwardly inclined pipe, with the upper extremity of the condensing worm or refrigerator, I, which is arranged in the tank or water holder, J. The tank is supported upon piers of brickwork as shown in the engraving, or in any other convenient way. The lower end of the condensing worm, I, is carried out through the side of the tank and terminates over a receiver or vessel, placed beneath to receive the distilled product. In distilling with this apparatus, the rough rosin is put into the still, B, through the man hole, which is left open. At first only a gentle heat is applied until the rosin is thoroughly melted, the contents of the still being meanwhile stirred by means of an agitator or rake, which is passed into the still through the man hole. When the rosin is properly melted, the man hole is closed by screwing down the plate, E, and the heat of the furnace is now raised, so as to cause the liquid rosin to boil up and evaporate. The gaseous resinous matters, as they are evolved from the boiling rosin, pass through the still head, and down the refrigerating worm, the first product of distillation condensed in the worm, is an acidulous fluid of no use in the manufacture of the rosin oil. As the distilling operation proceeds, the product of condensation assumes a spirituous character, and this product is succeeded by a heavy oil. When about thirteen hundred weight of rosin has been distilled, over from each ton desposited in the still, B, the distilling operation is to be stopped, and the residuum contained in the still, is to be drawn off by the pipe, C. The thirteen hundred weight, or thereabouts, of impure oil is now returned back into the still, B, the wire gauze diaphragm, G, is fitted into its place, and the man hole is closed. A brisk fire is made under the still, B, and the distilling operation is carried on until nearly the whole of the contents of the still has passed, or until about twelve hundred weight of the impure oil has been redistilled. The fire is then put out, or withdrawn from the furnace, A, and the rosin remaining in the still is drawn off by the waste pipe, C. The oil so obtained, although clear and bright in appearance, is not yet sufficiently purified as to be fit for burning in lamps. The diaphragm, G, is now to be taken out, and cleaned if necessary from any solid resinous matters that may be adhering to it. The oil produced by the second distillation is put back into the still, the man hole of which is closed, and the distilling operation again proceeded with. When the oil has been nearly all redistilled, the residual rosin in the still is drawn off therefrom. The oil resulting from this distillation is pure, clear, and bright, and in every way adapted for burning in lamps. The refrigerating worm, I, at about two-thirds of the way down, has a vertically projecting branch, into which is fitted the pipe, K, which communicates with the larger bent pipe or tubular receiver, L. To the lower part or bend in the receiver, L, is fitted a cock, M, and to the extremity of the receiver is connected the pipe, N, which is carried through the brickwork and over the fire-bars, its open end overhanging the burning fuel. The pipe, N, is furnished with a stop-cock, O, by means of which the contents of the pipe may be, from time to time, admitted to the furnace. During the progress of distillation, a portion of the uncondensed or incondensible gaseous matters flow off by the pipe, K, and any condensible oily matter is thrown down in the bent part of the receiver, L; the gaseous fluid flows off by the pipe, N, and is admitted, from time to time, into the furnace, where it is consumed, and assists in heating the still. The oil which condenses in the bend of the receiver, L, is drawn off at convenience by means of the cock, M, into a vessel placed beneath. A second pipe, P, is fitted lower down the refrigerator, to carry off any gaseous vapour which may flow past the pipe, K. The pipe, P, ascends to the receiver, Q, which is fitted with the cock, R, for drawing off the liquid contents; the receiver communicates with the pipe, S, the passage of which is controlled by the cock, T. The last portion of the incondensible gaseous vapour escapes up the pipe, P; and should it carry off with it any portion of the oil it collects in the receiver, Q, the gaseous vapour passing down the pipe, S, into the furnace. Instead of using this gaseous vapour as a heating medium, it may, if preferred, be collected in a suitable gas holder, and from thence be conveyed to the different parts of the manufactory, and used for illuminating purposes. With this arrangement of apparatus, the manufacture of rosin oil suitable for burning in lamps may be carried out in an economical and profitable manner. The arrangement of a lamp suitable for burning the refined rosin oil is delineated in fig. 2, which is a vertical section of the upper portion of the lamp. The metal collar, A, is the part which is cemented to the rim of the glass, metal, or other holder for the oil. This collar is made with an internal screw, into which is fitted the ring, B, which forms the lower part of the lamp. Passing through the disc of the part, B, is a semi-cylindrical tube, which, after rising a short distance above the disc, forms the concentric tubes, C and D, between which, the wick holder and wick traverse up and down. Projecting laterally from the outer tube, C, is a tubular boss, which forms the bearing of the spindle, E; this spindle projects out beyond the lamp, and terminates in a milled head. The inner end of the spindle, E, carries a pinion, F, which gears with a rack on the back of the wick holder, G, and by means of which the wick is raised as required. The semi-cylindrical portion of the tubes, C and D, opens through the part, B, into the oil reservoir beneath, and the lower part of the wick, which is made of a segmental figure to correspond, traverses in this channel when actuated by the pinion, F. The upper portion of the wick holder is cylindrical, and in trimming the lamp, the tubular wick, H, is cut partly through to admit of its being passed down the segmental part of the holder, and into the oil contained in the reservoir. In the centre of the tube, D, and rising up from the disc of the part, B, is a tube, I, which forms a guide for the spindle, J, of the adjustable button, K. The lower end of this spindle is screwed to admit of its being raised or lowered by means of the pinion, L, on the inner extremity of the spindle, M, which works through the tubular boss, N, and terminates in the milled head, O. This arrangement admits of the accurate adjustment of the button, K, so as to obtain the best deflecting effect on the flame. In the upper end of the tube, D, is a short tubular cap piece, P, which terminates immediately round the burning portion of the wick. Into the part, B, of the lamp is fitted the cup-shaped guard Q, to which is soldered the perforated screen, R, through which the air passes to the wick; inside the air screen is soldered the ring, S, which fits the tube, D. The air screen is formed in one piece with the outer gallery, T, on which the lamp shade or globe rests, and to this part is brazed the inner gallery, U, which holds the chimney glass. This arrangement of the air screen and the parts connected therewith ensures the due and abundant supply of air to the flame, so as to obtain the full illuminating effect from the burning oil.

SUPPLYING AND DISCHARGING WATER.

Richard Chrimes, *Rotherham.—Patent dated June* 4, 1859.

The improvements specified under these letters patent refer more particularly to the supply and discharge of water from public halting places; but they are also applicable to wash hand basins and other similar purposes.

Fig. 1 of the subjoined engravings is a sectional elevation of a urinal provided with the patentee's improved supply and discharge valve, which is represented shut. Fig. 2 is a corresponding section of the valve, shown quite open to discharge the contents of the urinal. A, is the body of the urinal, which is secured by snugs or small flanges, in the angle of two walls, the front forming a quarter circle. Beneath the urinal is fitted the valvular apparatus, B, which regulates the admission of water to the urinal, and allows its contents to be discharged when requisite. The plug, C, has a large thoroughfare, D, made through it, and when open, as shown in fig. 2, it forms a straight passage with the branch at the bottom of the urinal, which is fitted with the ordinary perforated grating. The inner end of the plug, C, is made hollow and open; this hollow portion has two apertures, E and F, cut in it opposite to each other, or nearly so. One of these apertures, E, is made considerably larger than the other, as will be seen in fig. 1; but either aperture is capable of being made to coincide with the branch passage, G, leading into the main thoroughfare or passage by simply turning the plug, C, half round. H, is a nozzle connected with the water service pipe, and I, is the waste water or overflow pipe which opens into the bottom of the urinal at or near the angle, but is divided off up to the top of the basin by the wall or partition of metal, J. This partition has a series of holes or slits, *f f*, formed in it near the top for the overflow of the waste water, and there is a cap or plug, K, fitted on the top of the space thus divided off, which can be taken out when the waste pipe requires cleaning.

When it is desired to flush the urinal, the plug, C, of the cock is

Fig. 1.

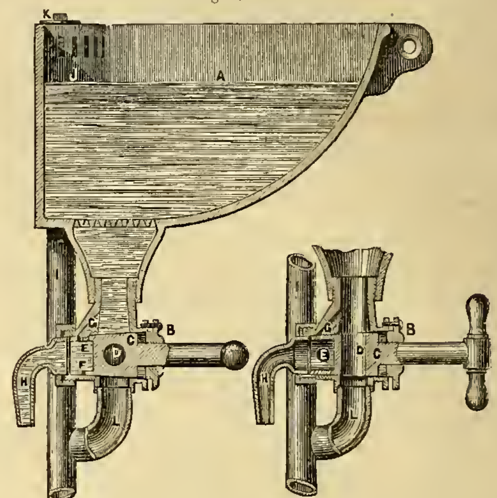


Fig. 2.

turned to the position shown in fig. 1, which admits of a plentiful supply of water being directed through the opening, E, in the plug, and through the perforated bottom of the urinal. When properly flushed out, the plug may be turned half round to the position, so as to bring the small aperture, F, to coincide with the branch, G, as E is in fig. 2, and thus shut off the larger aperture, E; this has the effect of allowing a small but constant flow of water passing upwards into the urinal, whilst the surplus flows off continuously into the waste pipe, I, by the overflow holes in the partition, J, thus keeping up a constant change of the water in the urinal, and preventing it from becoming offensive in any way. In order to discharge the contents entirely from the urinal, it is simply requisite to turn the plug, C, of the cock into the position shown at fig. 2, or one quarter of a turn back, by which means the main passage or thoroughfare, D, will be brought in line with the branch at the bottom of the basin, and thus forms a direct passage from the urinal by the lower branch, L, into the waste pipe, I. A similar cock to that illustrated may be employed for the purpose of supplying and discharging water to and from lavatories or wash-hand basins, with this difference, that the small aperture, F, is dispensed with, the two apertures or openings, D and E, only being requisite.

PERMANENT WAY.

Walter M'Lellan, *Glasgow*, (John Gregory, *Lisbon*).—*Patent dated August* 9, 1859.

The improvements, which have been communicated to Mr. M'Lellan under these letters patent, relate to a new form of sleeper and chair for holding and supporting the permanent way of railways, with a view of obtaining superior stability, combined with economy in the prime cost.

Fig. 1 of the subjoined engravings, is an end elevation of a pair of sleepers arranged for a line of rails, fig. 2 is a longitudinal elevation or side view, which figure also shows the fish joint for connecting the contiguous ends of rails. The sleeper, A, is of a rectangular figure curving upwards at the central portion into an arch-like form. The two ends of the sleeper rest on the ground, the arched portion thus serving to partially enclose a comparatively large mass of the ballast, upon which it rests firmly. And in order to give the sleeper a still firmer hold on the ballast, the metal is cast so as to form curved or undulating surfaces on the upper and lower faces, the corrugations extending across the sleeper in the direction of its width. The sleeper, A, is strengthened by casting on its under side transverse ribs or feathers, these ribs extend across in a diagonal direction from each corner. Each sleeper has cast in it two apertures, which are made at the spring of the arched part and parallel with the lateral edges of the sleeper. These apertures extend outwards through the laterally projecting collar pieces, C, which are intended to receive the ends of the tie bars, D; the collar pieces are by preference cast with rectangular apertures in them, but other shaped openings may, if preferred, be made therein. In this modification the tie bars, D, are simply flat bars of malleable iron, having slots made therein corresponding to the distance the sleepers are placed asunder. The tie bar for each pair of sleepers arranged opposite to each other, is passed through the apertures of the sleepers, and is fastened thereto by means of keys driven in through the slots of the tie bar, D. The corrugated arched form given to the sleepers admits of the ballast being driven firmly in at the open euds, so as to form a solid foundatiou for each

Fig. 1.

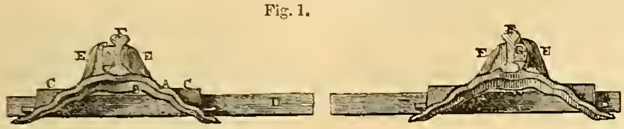


Fig. 2.

sleeper, the hold of the sleeper being greatly increased by the corrugated figure given to the surface. The open ends of these sleepers afford the utmost facility in getting at the ballast, so that it may be easily kept in a solid condition. Upou the upper part of the arch of the sleeper is cast the chair, E, in which the rail, F, is supported; the chairs are of the ordinary kind, but the sleepers may be cast solid, or in one piece, with chairs of any other form or configuration to which preference may be given. The rail, F, rests upon a curve or indentation on the upper part of the sleeper, and it is firmly wedged against the inner part of the chair by means of the wooden key, G. When the sleepers and rails are arranged in position, the thin flat tie bars, D, serve as an additional means for increasing the solidity and firmness of the sleepers, as the tie bars form a series of transverse ribs passing through the solid mass of rammed ballast. The means preferred for effecting the junction of contiguous rails is delineated in fig. 2, and consists simply of a short trough-like piece of wrought iron, or fish joint, H, the central part of which curves inward so as to embrace the lower part of the rail, F; above this inwardly curved part the sides of the fish joint, H, are continued upwards and reach the shoulder of the rail, fig. 2. A wooden key, I, is driven in between the lower face of the rail and the joint, H, two holes are made through the upper part of the joint and the rail, and the whole is firmly secured together by means of the bolts and nuts, J. These improved fish joints may also be constructed so as to dispense with the wooden key, I, in which ease the fish joint, H, is made of a shallower form to admit of the rail resting directly upon the inner surface of the fish joint. With these improvements, lines of railway can be laid down with great economy and despatch, the arrangement affording at the same time every possible facility for complete inspection and removal of any part if necessary.

TREATING AND PURIFYING GUTTA PERCHA.

Thomas Cattell, M.D., *London.—Patent dated February* 17, 1859.

The introduction of that most useful vegetable gum, gutta percha, has called forth the talent of a large number of inventors, with a view to its effective treatment and preparation, as well as extending its applications. The present patentee's improvements consist in the following new modes of treating and purifying gutta percha:—

First, by the stage involving the dissolution of the gutta percha. The gutta percha to be operated upon is preferred to be cleansed by any well-known mechanical processes, at the same time it is not essential for the purpose of this operation. The gutta percha is then exposed to the action of volatile solvents of two classes, in the proportion of one part by weight to about 15 parts of solvents. 1. That class whose solubility bears a ratio and relation to elevation of temperature, coal tar naptha, and its rectified products; also other hydro-carbons, turpentine, and resin spirit 2. The class which determines its solubility in the cold, technically so termed, bisulphuret of carbon and chloroform. As it is an object to extract the gutta percha as free as possible from the colouring as well as the feculent and insoluble matters, with which it is always more or less combined, the patentee treats either class of solvents specified,—First, while in their free condition, on the principle that the simultaneous solution of the colouring matters may be prevented or modified, without diminishing in any appreciable degree, the solventicity of the said agents in relation to the gutta percha. Secondly, when holding gutta percha in solution, on the principle that the colouring matters may be set free without disturbing the solubility of the said substance. In conducting this stage of the operation by the first class of solvents specified, there is added at the same time the gutta percha and the solvents are brought in contact, one ounce of alcohol, holding thirty drops of glycerine in solution to each gallon; or one ounce of alcohol holding thirty grains of soap in solution; or one ounce of pyroxylic spirit, holding thirty drops of glycerine in solution; or one ounce of commercial nitrate of the oxide of ethyl in the same proportion. A close vessel is used fitted with an agitator, heated by hot water or steam to a temperature of about 110° Fahrenheit, and kept in motion for about an hour, or until the gutta percha is dissolved. The whole is allowed to stand for twenty-four hours, when, if not sufficiently defecated and decolorised, the greater bulk of the gutta percha solution is decanted into another vessel, and either of the solutions, accompanied by agitation, is added, preferring the first solution already mixed with the solvent. In conducting this stage of the operation by the solvents of the second class, that is to say, by means of bisulphuret of carbon, no heat is applied. Second, by the stage involving the reduction or revival of the gutta percha from the state of solution, effected and treated in the manner described. The patentee further distinguishes this stage of the operation by a description of the three distinct processes, preferring the process of distillation and the process of precipitation to which he has recourse in effecting the recovery of the gutta percha.

The Process of Congelation.—In carrying out this process take a thick solution of the gutta percha prepared by the first class of solvents (preferring benzole), described under the first stage of the operation, and expose it to a temperature of thirty-two degrees of Fahrenheit's thermometer (or a lower temperature), so that congelation, that is to say, a solidified state of the gutta percha solution, may take place. Take this congelated or solidified mass, and complete the process in the following manner:—1st, submit the said mass to suitable pressure; 2d, submit the said mass to centrifugal force; 3d, treat the said mass in a way technically termed "filtration in vacuo."

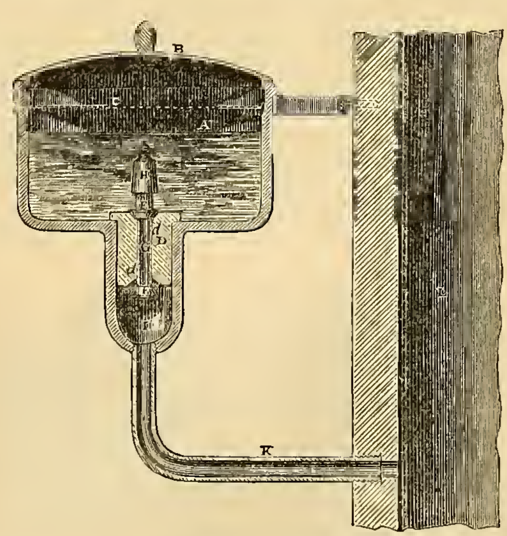
The Process of Distillation.—In this process, take solutions of gutta percha prepared by either class of volatile solvents described under the first stage of this operation, and effect a separation of the solvent and gutta percha by submitting them to distillation in direct contact with water or free steam. The patentee prefers to pass a current of steam into the water so as to maintain the water at a boiling temperature during the entire process. The vapours are condensed by being conducted through a "cooler," and the volatile solvents separated from the water in a proper receiver. When the vapour of the solvent ceases to pass off, the gutta percha is removed from the still or apparatus employed.

The Process of Precipitation.—In this process, take solutions of gutta percha prepared by the first class of solvents described under the first stage of the operation, preferring benzole solution, and mix therewith or add thereto about an equal measure of alcohol, methylated or not, about 65° over proof, or pyroxylic spirit (preferably anhydrous), or fusil oil. The mixed fluid is stirred for a few seconds, allowed to stand for a short time and then drawn off, leaving the gutta percha ready for use.

LUBRICATING APPARATUS.

William Finegan, *Belfast.—Patent dated August* 22, 1859.

In carrying out this invention the patentee employs a reservoir or receptacle for the lubricating material, fitted at the bottom with a double seated valve box, and two valves carried by a single spindle, and so



adjusted thereon that when one valve is closed, the other is full open, and *vice versa*, for the passage of the lubricant. Beneath these valves is a small chamber, connected by a pipe with the interior of the cylinder or other surface to be lubricated, subject to steam pressure. The illustrative figure represents a sectional view of the lubricator applied to the side of a steam cylinder. A, is a vessel for containing the lubricating material, it is provided with a lid, B, and wire gauze or other strainer, C. When practicable the patentee prefers to place this vessel or tallow receiver against the side of the cylinder, so that the heat of the cylinder will always keep the tallow in a melted state. At the bottom of this vessel is fitted a plug containing a pair of conical disc valves, E F, attached to one common screw spindle, G, and capable of adjustment nearer to or farther apart, by screwing the upper valve along its spindle and fixing it at any desired distance from the bottom valve by the nut or screwed head, H. I, is a chamber below the valves communicating by the pipe, K, with the interior of the steam cylinder, a portion of one side only being shown in section at L. Any number of these lubricators may be applied round a cylinder, or connected with the ends or covers thereof. The valves are so arranged that when one is closed the other will be open, and *vice versa*. The action of this lubricating apparatus is as follows:—On steam being admitted into the cylinder it exerts a pressure through the pipe, K, upon the bottom valve, F, and forces it into its seat at the bottom of the hollow plug, D. The top valve will consequently be thereby opened, and will allow a certain quantity of the lubricating material to descend and fill the chamber or hollow space, *d*, surrounding the valve spindle, and contained within the plug, D, between the two valve seats. When a vacuum or partial vacuum is established in the cylinder by the escape of the steam into the condenser, the atmospheric pressure will force down the upper lubricating valve, E, and open the lower one, F, thereby allowing the grease in the chamber, D, to escape down the pipe, K, in the cylinder, whilst the closing of the upper valve will prevent any more of the lubricant from escaping from the vessel, A. The re-admission of steam into the cylinder again elevates the valves, when the chamber, D, is again filled with the lubricant, and the operation is repeated as before. In this way a certain measured quantity of lubricating material (corresponding to the capacity of the chamber,) will be supplied to the cylinder at each stroke of the piston, so long as the engine is working, but when the engine is at rest the valve, E, will remain down on its seat and effectually prevent any superfluous or unnecessary flow of the lubricant into the cylinder. These lubricators may be applied to valve chests or other surfaces requiring to be lubricated subject to steam pressure.

SLIDE VALVES.

J. H. Johnson, *London and Glasgow* (R. C. Bristol, *Chicago, U. S.*)—*Patent dated July* 26, 1859.

These improvements consist in the application and use of four or other number of rolling surfaces or partial rollers for supporting a portion of the slide, such partial rollers not being subject to any friction upon their axes, nor involving any increase in the length of the steam chest. A sufficient portion only of the periphery of these partial rollers is left to allow of the full traverse of the roller, the remainder of the periphery being cut away, so as to obtain greater compactness. Another portion of this invention consists in so arranging an expansion valve on the back of the supported part of the slide before referred to, and disposing suitable steam passages through both parts of the slide, that the steam is conveyed to the cylinder ports through such passages along with the usual effect due to expansive working, whilst the two parts of the valve may be allowed to work to a limited extent relatively to each other, without involving a leakage of steam at the joints, which last object may in some cases be effected by interposing suitable packing between.

Fig. 1 of the accompanying engravings represents a side elevation of a locomotive slide valve constructed according to this invention, with the steam casing removed; fig. 2 is an end sectional elevation of the same

Fig. 1.

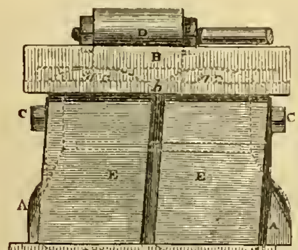
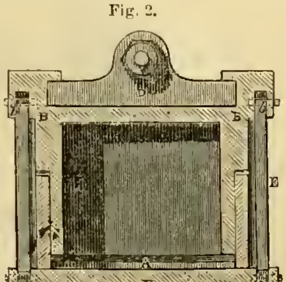
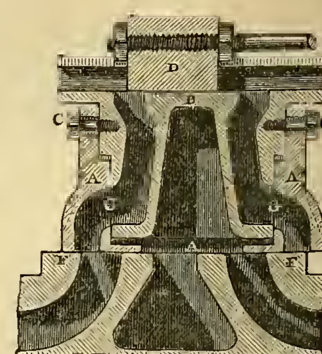


Fig. 2.



at right angles to fig. 1; fig. 3 is a longitudinal vertical section, corresponding to figs. 1 and 2. The valve is constructed in two portions, A B, the latter being fitted steam-tight into the former, so that it is adapted to slide vertically therein to a certain extent without allowing steam to pass through the joint. Set screws, C, are provided by which the portions, A B, may be made to hold their relative places very firmly if required. The "cut-off" valve, D, is fitted to slide steam-tight on the upper face of B, and is guided thereon by ledges or lips. At the top of the face, B, there is an overhanging flange at each side, grooved on the under side at B, into which the upper ends of the partial rollers, E, work, and being introduced between these overhanging flanges, and the cylinder face, F, they support B, on the curved ends of their several peripheries, and compel it to travel in a plane parallel to the face, F. The overhanging portion or flange, *b*, of the part, B, are made to enclose and confine the upper sides or circular ends of these partial rollers, and the lower sides or lower curved ends thereof are enclosed or confined by analogous means, on or near the cylinder face. Suitable apertures are made at *a*, through the partial rollers, E, near their

Fig. 3.



extremities, and pins inserted which extend through these slots into the sides of the grooves formed in the flanges, *b*, and in the face of the cylinder, F. These apertures or slots at *a*, are of such form as to allow the partial rollers to play to the proper extent, without touching the pins, so long as the partial rollers are in their correct positions, but the moment one of them becomes displaced at either the top or the bottom, it presses the side of the corresponding slot, *a*, against its pin, and thus prevents itself from becoming more displaced. Any sensible displacement of either of the partial rollers also causes it to meet the other, or to meet the stops or ends of the grooves, *b*, at each vibration, and thus to aid in preventing further displacement. The dotted outlines show the condition of these partial rollers at the end of each movement of the valve. The steam is admitted to the ports in the cylinder through the passages, G, in the respective parts, A and B. These passages are arranged, as represented, so that the part, A, may slide vertically upon B, and *vice versa*, without closing the passages, and without producing any leak at the joint or dividing line. In commencing to use and arrange the valve, the set screws, C, are slackened, and the part, A, is thus allowed to be pressed down into steam-tight contact with the cylinder face, F, by the pressure of the steam on that part of A, which is not protected therefrom by B. It is usually worked for several days in this condition, so that it is free to rise and sink without effecting the part, B, and is then (either at a single operation, or by gradually increasing the tightness at several operations) set firmly in relation to B, by turning the set screws, C, in which case it continues to fit tightly upon the cylinder face, F, by reason that the motion of B, is parallel thereto. In the form and proportion of valve shown, the part, B, is fitted in perfect steam tight contact with the part, A, yet not pressing against the same so tightly as to prevent a motion of the parts, one within the other. To avoid the necessity for such accurate workmanship at this joint, a simple India-rubber, or other suitable packing, may be inserted when preferred.

This invention is capable of being constructed in various forms and proportions, other than that represented. For example, any variety of "cut-off" or expansion valve or device, which is suitable to work on the back, or within the body of other slide valves, may be employed in lieu of the valve, D. Broad heads may also be formed on the pins, at *a*, which pins may be threaded and tapped into the respective parts, so as to act as bolts, and thus a lateral play of the partial rollers, E, may be prevented by the heads of the bolts in lieu of by the outside lips of the grooves, *b*, as represented; or the sides of the steam chest may, if desired, or when it is necessary to economise space, be made to touch and confine the holders, E. Instead of making the valve in two parts, as shown by A and B, it may be made in one piece, and the ways or flanges, *b*, be made adjustable by means of screws or wedge shaped keys or gibs, or other suitable means.

MECHANIC'S LIBRARY.

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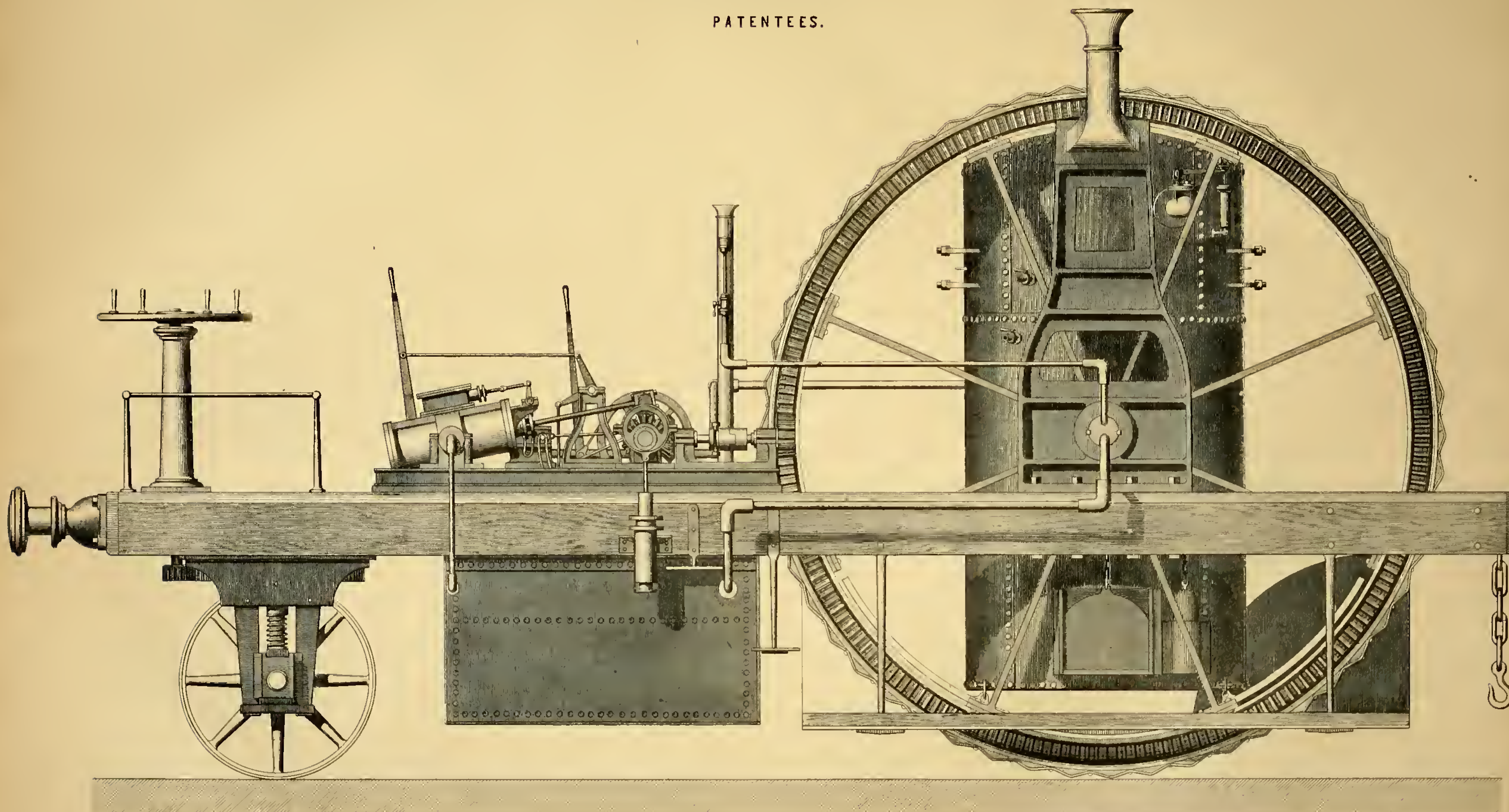
DRUM TRACTION ENGINE,

I & R. BLACKBURN,

LONG EATON, DERBY,

PATENTEES.



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W. Johnson, Patent Offices,
47 Lincoln's Inn Fields & Glasgow.

Printed by Mackay & Kirkwood Glasgow

Plate. 256.

1ST MAY, 1860.
Second Series
Vol. V.

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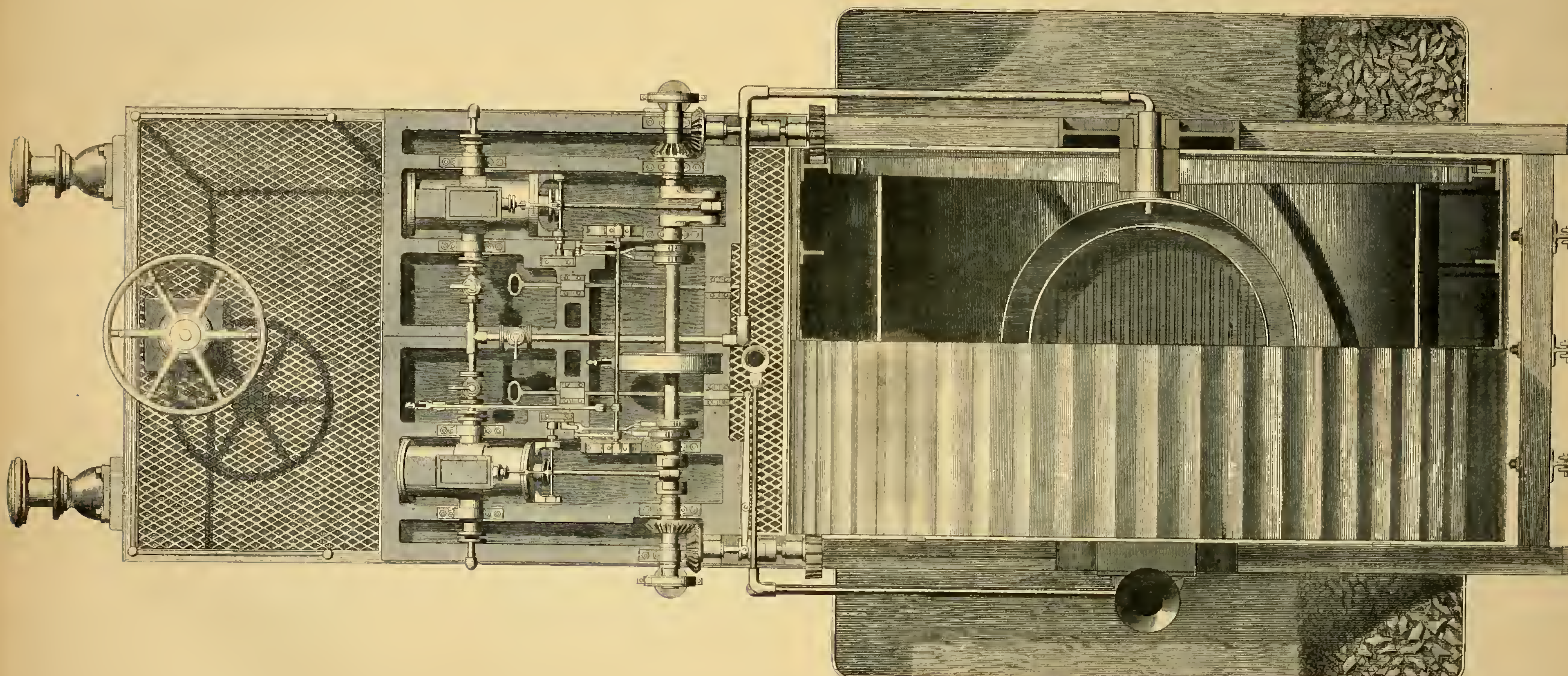

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LAW REPORTS OF PATENT CASES.

Patent Type Founding Company (Limited) *v.* Walters. Inspection.—At page 10 of this *Journal*, we reported an application made by the plaintiffs to the Court of Exchequer, for a rule that the plaintiffs might be at liberty to inspect type belonging to the defendant, and if necessary to take specimens of the same, for the purpose of being analysed. The common law judges having refused the application, the plaintiffs filed their bill in Chancery, and now moved before Wood, V. C. for an injunction to restrain the use in printing *The Times* of type made according to the plaintiffs specification; and also for liberty to inspect and take samples for analysis. Counsel having been heard on both sides, the Vice-Chancellor was of opinion, that with reference to its inspection, the Court had jurisdiction to grant the application. There had been no such laches as to amount to a total abandonment by the plaintiffs of their patent right, or to lead the Court to refuse them a perpetual injunction, at the hearing after they had established their right at law. The discovery here sought was not in aid of the proceedings at law, but for the purpose of assisting the Court in coming to a decision at the hearing, and it was only reasonable and right, that the case should be put in a form for trial. The order would be that liberty should be given to two persons (named in the order) to inspect the type used in printing *The Times* newspaper, and that a competent portion (not exceding 4 ounces) of the type which has been used in printing *The Times*, and which is not required for further use, showed he delivered for the purpose of analysis.

Important Decision in a Sewing Machine Suit.—In the United States District Court, Judge Sprague gave an opinion in the long pending suits of Elias Howe, jr., against C. W. Williams and others, and A. Morton and others. Mr. Howe claims an exclusive right in a certain principle necessary in all sewing machines, and the defendants in these cases—the owners of the Sloat and Williams machines—resisted his claim and used his alleged invention without permission. The decision of the Court establishes the right of Mr. Howe, and the machines of the defendants are held as infringements of his patents.

Injunctions were ordered to issue against the respondents, unless they make a satisfactory arrangement with Mr. Howe, to continue their manufacture. These cases have excited deep interest among those interested in the manufacture and sale of sewing machines, and a vast amount of money was pending on the result of the suits. B. R. Curtis and Joel Giles were counsel for Mr. Howe; and Caleb Cushing, H. F. Durant and A. C. Washburn appeared for the other party. A stronger legal team could hardly be gathered on either side.

Registry of Proprietors.—Stamp. Patent Law Amendment Act, 1852. Noone's Patent.—This was a motion on behalf of Mr. Noone, the patentee of an invention for "improvements in machinery for generating gas from coal," that a memorandum of agreement which had been entered on the register of proprietors, kept at the office appropriated for filing specifications, under 15 and 16 Vict., c. 83, sec. 35, might under sec. 38 of that Act be expunged from such register. The agreement was unstamped. The Master of the Rolls stated that the agreement being unstamped ought not to have been received by the officer of the patent office, and could not, so long as it remained unstamped, be looked at by the court. His Honour allowed the motion to stand over till the next seal, in order to enable the person claiming under the agreement to have it properly stamped.

Fraudulent Trade Marks.—A deputation from the manufacturing towns of the north, accompanied by Mr. Roebuck, M.P., Mr. Thomas Bazley, M.P., Mr. William Scholefield, M.P., and Mr. J. P. Brown Westhead, had an audience lately with Mr. Milner Gibson, at the Board of Trade, to complain of the practice of putting false labels upon goods. Mr Brook, jun., referred especially to the custom of giving short lengths on reels of cotton, and handed to Mr Gibson a reel of cotton marked as containing 100 yards, but in which there were only 45; and also reels marked 300 yards, but containing only 200 yards. Mr. Gibson asked if the law did not deal already with the short measures? Mr. Roebuck said, "Yes, but by a very roundabout process, and we wish to obtain an enactment enabling us to proceed summarily as a fraud." Mr. Ashworth said there were reels sold in which the maker's name was false, the length was false, and the quality was false. They could not ascertain who manufactured them. If they asked the dealer, he would say he did not know the length was short, as he never measured it, and he (Mr. Ashworth) thought this should be rendered compulsory. The question was not an insignificant one, involving two or three thousand pounds, but hundred of thousands of pounds were invested in that trade. There was another branch in which this system was carried on; he referred to the jaconnets for lining coats; these were rolled up very tight, and tied in parcels labelled twenty or twenty-four yards, but in reality there were only eighteen yards; this was sometimes reduced even to a still lower number, and there was nothing to prevent its going on further. There was no individual remedy; therefore they came to the Government to ask them to make a law which would protect the honest trader. It was customary for many houses to give orders for goods purporting to be of certain lengths, but to contain a less quantity, and if one manufacturer did not do it, another would. After some conversation, Mr. Roebuck said there was a man in America named Collins who had a great reputation for the axes he made; every one used Collins's axe, and the Birmingham manufacturers consequently made similar axes, which they stamped with the name of Collins, and sent to America for sale. This was done by every house in Birmingham, excepting three. It was then arranged that a draught of a bill should be prepared to be submitted to the law officers of the Crown with a view of meeting the case. The deputation, having thanked Mr. Milner Gibson, then withdrew.

STEAM CULTIVATION OF THE SOIL—DRUM TRACTION ENGINE.

By Messrs. I. & R. Blackburn, *Engineers, Long Eaton, Derby.*

(*Illustrated by Plates* 255 *and* 256.)

Having so far endeavoured to show that direct traction, on anything like a level country, is superior in all points, to the stationary or indirect system, we will now proceed to give some explanation of the engine best adapted to the purpose. It has already been shown that a locomotive requires a large traction and supporting surface, not only to give it sufficient adhesive power, but also to prevent injury to the soil by consolidation; and to obtain this, Messrs. I. & R. Blackburn of Long Eaton, Debry, whose engine we now engrave in plates 255 and 256, have recourse to a large drum or cylinder, which acts as a wheel to bear up the whole of the heavy portion of the engine. Plate 255 is a complete side elevation of the engine; and plate 256 represents it in plan, partially in horizontal section. Within the drum the boiler is placed, being suspended by strong axles riveted to it; the diameter of the drum is ten feet, and it is six feet in width; and we obtain, therefore, a bearing and tractive surface of nine square feet, or 1300 square inches. The entire weight of the boiler, engines, and drum, is but seven tons, so that there is merely a weight of twelve lbs. thrown on every square inch of the surface, while that of a horse's foot is twenty-eight lbs. on every square inch, or more than double. There is a frame carried forward from the centre of the drum on both sides, which being connected with leading wheels in front, acts as a lever to the drum, and this being inclined by manual power, turns and guides the locomotive with the utmost facility upon the same principle that the handle of a garden roller turns the roller. One of these engines which are nominally ten horse power, will plough or cultivate ten acres a day; clod crush and harrow, in *one operation*, twenty acres, or roll efficiently either forty acres of grass or wheat in the same time, with the additional advantage, that the land so rolled will be left smooth on its surface showing no imprint of its passage, neither will the plant be injured as is the case when rolling is effected by horse power. This engine will perform all the heavy work in a farm, and that too most efficiently and economically.

It is a cultivator in itself, being by its construction a most effective steam clod crusher and roller, and on light soils would prove of immense advantage in rolling wheat, and giving the necessary consolidation to the surface for the purpose of strengthening the tender plant; the heavy working speed is set to three miles an hour, but while it is doing light work such as rolling, it will travel with ease at five or six miles an hour, or more if desired. The large proportions of the bearing wheel or drum enables it to pass over irregular surfaces with extraordinary facility, requiring but twenty-five per cent. of its own power to propel it on a level. The drum being made of boiler plate, half an inch in thickness, with five internal ribs of angle iron, is so exceedingly strong that it cannot be injured by work, and will remain for twenty years in good condition without repair; it matters not how rugged or soft the ground is over which it has to pass, for it cannot sink in nor can it be stopped or retarded by any reasonable obstruction. The energy of the engines is transmitted by a pinion on the crank shaft to large wheels, which are bolted to the drum; it is next to impossible to break out a tooth, for the principle is such that under any undue strain it would be relieved by the balance; the engine being suspended, equalizes itself under all circumstances.

The best method of employing this locomotive on large fields of thirty acres and upwards, is to adopt a system never before attempted. This is *circle cultivation.* The engine should commence in the centre of the field and describe at first a small circle or ellipse, allowing the circle gradually to depart from a true one, equal to the width of the number of furrows turned over. The engine will then move continually in an enlarging circle, until the whole field is ploughed with the exception of the corners. By this method there is no time lost in turning at the head lands or any difficulty with the ploughs, which will be hung in a frame—the only objection is that of the corners, but these can be reduced by humouring the engine, so as to leave but ten per cent. of the whole unploughed, which can be done by horses. It has been said that if an engine goes into a field to cultivate by steam, the work should be entirely finished by it; no one will doubt that this would be desirable, but it is to be feared whether in any case it would be profitable. If a plan could be brought out, which on the whole, would save 50 per cent. or more, in comparison to horse ploughing, its adoption would be desirable, though some slight objections could be raised to the several details of the operation. The great advantage of adopting the foregoing plan is obvious from the fact that if the engine was to draw six ploughs, turning nine inch furrows, it would plough fifteen acres daily, going three miles an hour, and working but nine hours each day. The engine will, however, plough in straight lines equally well with horses, and turn at the headlands in twice its own length, or thirty six feet.

We now come to a matter of vital importance, viz., the expense or cost of working by steam power; this entirely depends upon the amount of power used, and the simplicity of the arrangements in working that power. An impression is pretty general amongst agriculturists, that they can adapt their ordinary 7-horse portable engines to the necessities of the soil; this idea is extremely erroneous, and in itself precludes the possibility of success in cultivating by steam power; the thrashing machine is but a trifling affair to drive in comparison to a frame of four or six ploughs, working seven or eight inches deep, and an engine which may do well for the one operation is totally unfit for the other. A 7-horse portable engine could only, under the most favourable circumstances, plough three acres a day, and as the standing expenses for coal, labour, wear and tear, interest, and general depreciation, reach 30s. daily, there remains no margin for profit, unless the superiority of the work accomplished by steam power is taken into account.

The cost of working a small engine is very nearly as much as that of a large one, hence it is desirable to employ large power and thereby obtain large results. An engine either to cultivate by direct or indirect traction, ought to be at least 14-horses nominal power, and capable of drawing six ploughs with ease. If worked at three miles an hour, ten acres may readily be turned over in eight hours work, and as the cost would not exceed 40s. daily, everything included, there would remain a balance of 60s., allowing 10s. an acre for the value of the work, which, however, is much below the real value. If the land is hilly and the gradients greater than one in fifteen it may be desirable to use the rope This engine would then travel to the field, taking with it the anchors, implements, &c., and with an endless rope will pull four ploughs in a frame with ease; but when locomotion can possibly be used, though at a considerable sacrifice of power, it will be preferable and more economical.

There has lately been considerable discussion on a proposal to lay down tramways on fields, and it has seriously been advocated that an outlay of £20,000 on one thousand acres of land would prove a remunerative speculation. If large sums, such as this are ready to be invested provided a profitable result can be realised, can it be doubted that an investment of £1000, or five per cent. of this large amount would be a desirable one, when by such outlay an engine and implements may be obtained which will cultivate 1000 acres of land profitably and efficiently, placing the agriculturist in a position to till his land while the weather is favourable, and enabling him to do it in a superior manner? Those who desire to avail themselves of the assistance of that great master-power, steam, would do well to look at the whole thing in a liberal spirit, procure properly constructed locomotives and implements, adapted either to direct or indirect traction, and they may rest assured that in so doing they will reap the reward which attaches to all enterprises based upon sound principles, and carried out with energy and hearty good will.

There can be no reasonable doubt, we think, that the "drum," or broad cylinder principle, such as developed by Messrs. Blackburn, is the one which must hereafter come into general use for all traction engines, and especially for those used for agricultural purposes, or which have to encounter soft roads. On any roads—seeing how roads vary in level and density—we conceive the drum to be far preferable to ordinary wheels, as well for the reasons which we have already stated, as for many others which must be obvious to all who carefully examine the plate. Besides this, the engine is well balanced, the main weight well supported, and the steam power is applied to the drum in the most perfect way.

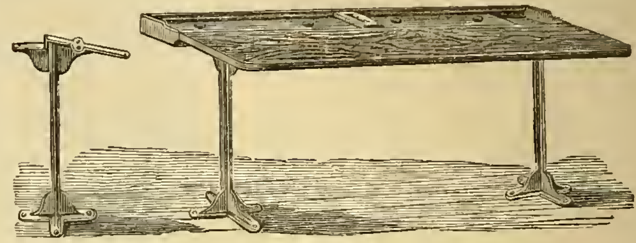
For colonial work, such an engine must be eminently useful on common roads, and for passing the frequently occurring morasses and marshy grounds; whilst in India, in particular, troops could be conveyed by it very cheaply, in great masses, at the rate of five miles an hour.

REGISTERED DESIGNS.

SCHOOL DESK.

Registered for the Rev. J. B. Rowe, *the Oratory, Brompton.*

An excellent form of school desk has been recently registered by the Rev. J. B. Rowe, who has the care of the Schools of Compassion, Charles Street, Drury Lane. These desks are manufactured by the boys in the industrial department of the schools referred to, and afford a very praiseworthy medium of providing employment for the pupils. The object aimed at in this desk, has been to unite with a skeleton form of desk, an arrangement to protect the ink from dust, and to keep it out of the reach of the children when they are not writing, without removing the inkwells, and at the same time to provide a receptacle for pens, pencils, &c. A moveable slide is so arranged that by slipping it backward or forward, the inkwells are either exposed or covered, and in either case the slide is fastened by a small lock, so that the children cannot play with it. It



is protected from being broken, by the fact that it cannot be drawn out without unscrewing and removing the end of the desk. The top of the slide, the part of the slope of the desk above the groove in which the slide works, together with the corresponding projection above the groove in the back of the desk, form a receptacle for pens, pencils, &c., and the desk is mounted on an iron standard, cast expressly for it, which corresponds to every part of it, to secure strength. The construction is so simple that it cannot get out of order, and its strength may be confidently relied on.

REVIEWS OF NEW BOOKS.

Report on the Vital and Economic Statistics of Glasgow, for 1859. By John Strang, LL.D. 8vo. pp. 32. Glasgow: 1860.

The steady increase of Glasgow, in population and wealth, and consequently, in its area of inhabited buildings, its shipping and its productive and convertive manufactures, is carefully shown year by year by Dr. Strang, the energetic chamberlain of the city. Such a report upon such a city as Glasgow, must necessarily be of the highest value to the general public, for it conveys information of a most interesting and truly valuable kind, applicable in most of its bearings, to the management of the social affairs of the wide world In dissecting the matter which the author has laid before us, we find that according to the return in June last, Glasgow proper contains 78,312 inhabited houses. The number of separate families is greater than the number of houses, by 1·187; so that adding this excess, we have what may be virtually taken as 79·499 houses in the city. Now, by multiplying this number by the mean number of persons belonging to each family which were found in Glasgow at the last census, which was 5·05, and adding thereto an equivalent number for the present inmates of the public institutions and the sailors in the harbours, viz., 5,531, the present population within the parliamentary city may be fairly estimated at 407,000. Were, however, we to add to this the excluded parliamentary portion of the ancient burgh, and the extensive and growing suburbs which constitute the portions of the parishes of Barony and Govan without the parliamentary boundaries, and which may now be regarded as an integral part of Glasgow, the population must have reached in 1859 to 440,000. The number 407,000 is, however, that with which the author deals. The births within this boundary of the population were, last year, 15,946; of which 8,110 were males and 7,836 females. Compared with 1858, the sum total shows an increase of but 49. The ratio to the population is 1 to 25·4, or 3·94 per cent. Of marriages there were 3467, showing an increase of 294 over 1858, the ratio to population being 1 to 117, or 0.85 per cent. The deaths were 10,832, or 1 to 37·5 of the population. We are sorry to see that of this number, there is so great a proportion of infants—amounting indeed, to 51·4 per cent. of the whole. During the year ending 30th June, 1859, the total number of arrivals of steam and sailing vessels at the Glasgow harbour was 17,817, with a tonnage of 1,544,789, which, when compared with 1857-58, shows a decrease in the number of vessels of 329, and of tonnage of 20,102. While the number of vessels arriving and departing have slightly diminished, the imports and exports, given in tons, have advanced. During the year 1858-59 there arrived at the harbour of Glasgow 12,403 steam vessels, having a tonnage of 1,104,182. The post-office statistics show that 12,709,333 letters were delivered in Glasgow during the past year, showing an increase of nearly 2,500,000 in five years. The total number of letters passed through the Glasgow post-office during the year was very nearly

30,000,000. The local telegraph office accounts tell us that 64,119 messages were sent from Glasgow during the year, and that 68,088 were received. There are 23 omnibuses plying within the city, each travelling daily 50 miles, or in all, 1,150 miles per day; and there are 30 suburban omnibuses, each travelling daily 40 miles, or 1,200 miles—these being worked by about 550 horses; while the number of persons carried daily by them amounts to 12,500—the average fare paid for each mile travelled over being about 1d. Such are some of the leading indications of Glasgow's progress.

Patents for Inventions.—Abridgments of Specifications relating to Electricity and Magnetism, their Generation and Application. Printed by order of the Commissioners of Patents. 8vo. Pp. 769. London: Great Seal Patent Office. 1859.

Little as we at present know of those curious forces, electricity and magnetism, we comprehend enough of them to be certain that to them we must look intently for any great extension of our existing sources of mechanical power. In the face of the hitherto unrivalled power of steam, attention has been most unremittingly given to the development and practical working out of these hidden forces of the earth, and with results, which, if not so far economically successful, are valuable enough to induce further and still more constant research. The reservoirs of these wondrous powers, are, humanly speaking, boundless, for they pervade the whole globe. It must be our business to get at them, and that is the difficulty of the practical investigators and philosophers of the present day. If the labours of the present workers in this great field can be lightened by a great legendary and historical compilation of details affecting the subject—as we firmly believe they can—and to a soundly practical end—then we may safely allege that this volume of "Abridgments of Specifications relating to Electricity and Magnetism, their Generation and Applications," will prove to be by far the most important aid which working philosophers have ever received.

This very valuable volume, which has been compiled by Mr. W. H. Walenn, under the official supervision of Mr. Woodcroft, of the Great Seal Patent Office, goes back under the head "Magnetism" to the date 2600 B.C., and under the head "Electricity" to 600 B.C.—not that patents were granted in those days, but that the earliest dawn of traditional history might thus contribute some light on the subject—and brings its practical information in the shape of well-digested abstracts of English specifications from the year 1766 down to 1854. It thus affords a complete history of the two wonderful forces, which—but toys at present, as regards mechanical powers—man fondly hopes to bend to his will, as hard working servants, outrivalling even the industrial performances of coal and water in the great engine now spread over almost every corner of the civilised world, constantly at work, and adapted to every conceivable occupation. Mr. Woodcroft thus explains the special reasons for the production of such volumes as this, and the system under which the present specifications have been taken and classed:—

"The Indexes to Patents are now so numerous and costly as to be placed beyond the reach of a large number of inventors and others, to whom they have become indispensable.

"To obviate this difficulty, short abstracts or abridgments of the specifications of patents under each head of invention have been prepared for publication separately, and so arranged as to form at once a chronological, subject-matter, reference, and alphabetical index to the class to which they relate. As these publications do not supersede the necessity for consulting the specifications, the prices at which the latter are sold have been added.

"The following rules have been adopted in deciding which specifications belong to this series of inventions:—

"1st. To include all specifications in which mention is made of electric or magnetic force as applicable in carrying out the invention.

"2nd. To include all which depend on electric or magnetic science, whether such dependence is mentioned or not.

"3rd. To exclude those in which no mention is made of their application to electric or magnetic purposes, although it may be somewhat evident that such application might be made. For instance, as in the specification of letters patent, No. 6896 (old law), no mention is distinctly and directly made of the application of gutta percha to the coating or covering of wire for electrical purposes, it is not included in this series, although such an application of the invention is evident.

"4th. To exclude all those in which no other allusion to electric or magnetic science is made than the word 'galvanised,' as applied in the ordinary process of zincing iron.

"In all cases in which a reasonable doubt exists as to whether an invention is to be included in this series or not, the abridgment is included, and the cause of doubt stated.

"In making the abridgments of specifications of mechanical applications of electricity and magnetism, the rule of tracing their operation from the prime mover to the result has been observed, when possible. A similar rule has been observed with reference to electro-chemical processes. The course of the electric current from one battery pole to the other, through the work to be done, has been traced in all cases in which such a method of treating the subject could tend to clearness of description. When the complicated nature of the subject requires it, each description is begun by a short summary of the whole action of the machine or process treated of."

Care has also been taken to provide for misunderstandings as to the meanings of technical terms, by the addition of a table of definitions. This is a very necessary appendage—for the mass of specifications discloses great confusion of ideas on the part of inventors in this respect. An index of "subject matter" completes the volume, so that the investigator can be at no loss in turning at once to the special class of inventions to which he is directing his attention.

Mr. Walenn appears to have performed his task of selection and condensation in a most praiseworthy manner, and he has carried out Mr. Woodcroft's very valuable idea in a way which leaves nothing further to be desired. It is to Mr. Woodcroft that we are entirely indebted for the possession of books which give us the very essence and spirit of classed inventions. Here we have an excellent volume on a most important subject, telling all its tales in the fewest possible number of words, upwards of two inches thick, and weighing 2¼ pounds, published at the low cost of 8s. 6d. Every inventor must certainly be very grateful to the indefatigable projector for what he is thus doing for them.

The Sale of Gas; Gas to Street Lamps; The Right to lay Mains; and some other Vexed Questions. By J. O. N. Rutter, F.R.A.S. 8vo. Pp. 40. London: J. W. Parker & Son. 1860.

The talented manager of the Black Rock Gas-works at Brighton has stepped into the ranks with those who are doing battle in the great contest now raging between the public or the consumers, and the producers of illuminating gas. He takes the same hopeful view of the subject that we have so often expressed in these pages, and contrasts, as we have done, our present gas-illumined condition with what it would be on a return to candles, lamps, and darkness. He takes up the question of the supply of "gas to street lamps," and discusses the complaints against the existing street lamp system, or rather, we may say, the uncertain and unsatisfactory nature of that system as between gas makers and the towns. In doing this he, not unnaturally, says a good deal in favour of the companies; on the principle, we suppose, that

"A fellow feeling makes us wondrous kind."

A professional gas maker—he stands up for his order, and he points out the difficulties under which the companies labour in adjusting their lamps in all weathers and at all seasons, to the determined standard of consumption. This is true enough, but we may say in reply that the public does not often get an over supply of light; the "difficulties" seem to tend mostly to the side of the companies. We agree with Mr. Rutter, that street lamps in all, or most cases do receive more than their stipulated quantity of gas, but we should suppose it to be the look out of the companies to prevent the leakage to which the loss must inevitably be owing. Mr. Rutter says:—How few are there who possess any practical knowledge of the means employed for ascertaining the quantity of gas which passes in any given period of time through a burner! They may know that gas is measured, and that a gas-meter is a very ingeniously-constructed and useful machine; but they are not likely to know much about the principle of the meter, and the laws which control the transmission of aëriform bodies. They will, however, be very well informed about one of the conditions connected with the street lamps, namely, that the greater the quantity of gas the larger will be the flame, and the smaller the quantity of gas the less will be the flame. Still, with even this amount of information, the persons who possess it are not thereby enabled, by observation only, to decide authoritatively upon the quantity of gas passing through a certain burner. Few persons, excepting those professionally connected with gas operations, and skilled in conducting photometrical experiments, are able to determine by observation what should be the exact size of a gas-flame, when consuming five or any other number of cubic feet perhour. The most practised eyes are very often at fault in comparing an accurately-adjusted gas flame, burning tranquilly within doors, with that which is flickering in a street lamp out of doors. This will be more readily understood when it is remembered that the experimental gas-flame is fixed as nearly as possible on a level with the eyes of the observer. In the street lamp the flame is four or five feet above the eyes. So, also, with respect to the burners, it is only fair to suppose that the one used for an experiment would be in good condition, whilst those in the street lamps soon become worn and corroded.

This is all very well, but we doubt if most people will not still attribute diminutive flames to a diminutive supply of gas; although every engineer knows that a large quantity of gas driven through a burner has an effect the reverse of that of giving a brilliant light. The flame flickers, the gas is imperfectly consumed, and the light itself is shaky and feeble.

In the author's summing up, we agree that the chief difficulty in the matter, is the apparent impossibility of actually measuring the quantity of gas supplied for street purposes. Hence the companies think they supply too much, whilst the owners of property fancy they get too little. There is but one remedy for this, and that is, a better system on the part of the companies of regulating the supply of the gas, preventing the leakage, and arranging and keeping in order the burners. Why should these points not be attained in such a manner as to bring up the system of street supply pretty nearly to the level of the domestic one?

Mr. Rutter himself suggests the use of a meter at each lamp, but we confess we cannot at present see how the expense and difficulty of management are to be got over.

As regards the sale of gas—more particularly in the metropolis—he lays great stress upon the injustice inflicted upon the general public, by the use of the part measure, and part contract system;—and here he is perfectly right. Let us by all means have the meter system universal. He offers various sensible suggestions on the subject, and for these we must refer our interested readers, to the very useful and well-timed pages which Mr. Rutter has laid before us.

CORRESPONDENCE.

THE ROTATION OF BODIES ON THEIR AXES.

"Strange to say," says Sir John Herschel, "there are persons who find it difficult to regard as a rotation on its own axis the peculiarity of the moon's motion, which consists in its keeping the same face towards the earth. Should any of our readers be in this predicament we recommend him to plant a staff upright in the ground, and grasping it with both hands walk round it, keeping as close to it as possible, with his face always turned towards it, when the unmistakeable sensation of giddiness will effectually satisfy him of the fact of his rotation on his own axis."

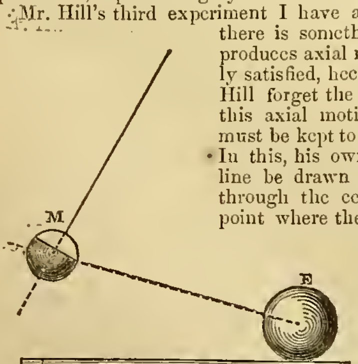
I have nowhere asserted that the moon does not rotate upon her own axis, neither have I "avowed" that the mechanical question raised in my letter of December last, does not *involve* the question of the moon's rotation. But I do assert that a man in walking round a staff, a table, or any other object, keeping his face to the centre of that object, does not rotate upon "*his own axis*."

This mechanical fallacy (in my opinion,) having been promulgated upon high authority, needs, if possible, to be refuted or proved by something more than words by those who assert it. It is with such men as Mr. Hill, and others who try to maintain this fallacy by false conclusions, drawn from deceptive experiments, that I have to do.

The indicator proposed by Mr. Hill, to show the fifth rotation of the ball, B, is, mechanically speaking, no indicator of the motions of the ball, B; if so, it ought to have made four twists in one revolution round the axis, A; besides, an indicator to show the motions of a machine must be wholly fixed to that machine, and not to any external object. Mr. Hill, by the means employed, arrives at a twist; but like the "unmistakable giddiness," this twist is not the result of the rotation of the ball, B, on its own axis, but the effect of the attachment of the tape to the ceiling, and the rotation of the frame round the axis, A. The twist produced by the tape attached to the man's hat, and the twist obtained by the neckcloth are of the same class

Is Mr. Hill prepared to say that the man on a rope-walk rotates upon "*his own axis*" at every twist made by the machine? if so, how is it he has none of that "unmistakable giddiness" when he arrives at the end? If there was a fraction of truth in the conclusions drawn from these experiments, rope making by manual labour would have been impossible.

Mr. Hill's third experiment I have already noticed in my last, but there is something more in it. Mr. Hill here produces axial motion, with which I am perfectly satisfied, because it is palpable, but does Mr. Hill forget the rest of the problem, that while this axial motion is going on, the same face must be kept to the ball representing the earth? In this, his own case, it is impossible. Let a line be drawn from the centre of the ball, E, through the centre of the moon, M, from the point where the line first touches the moon, M, draw a line at right angles to the axial motion; now the circumference marked by this line will be constantly changing its face in regard to the earth, E, during its axial motion.



Mr. Hill's fourth article arrives at nothing tangible, but in place of it let me notice the assertion that bodies launched into space naturally take axial rotation; this has long been asserted, but is not a scientific fact.

The best illustration of a planetary body floating in free space that the art of man has ever produced, is evidently contrary to this opinion, that is, *a balloon*. A balloon rising from the earth without the intervention of mechanical force or any external connection, is free to take all the natural motion supposed to be possessed by floating bodies. The balloon in its course, if the wind continues in the same direction, would revolve round the earth, but it will not have axial motion. A soap bubble is again an illustration of the same fact, and wherever the reverse is observed, it is caused by the impulse of some external or overruling force, as in the ball of the rifle, and such as the sly slap of the head given by the rotatory catapulta before the ball leaves its tender care, assisting to accelerate what the string is too willing to perform. A string, plaited or not, will cause this, on account of the tendency of a ball of any weight when swinging round, to stretch it, whereas in the case of a sling, the four strings counteract the tendency to untwist, therefore it has no axial rotation. In all cases where this axial motion takes place it is in a line with the centre of motion, as in my illustration, No. 1, and not at right angles to it, as asserted in regard to the man going round the staff. "Lastly, the following mode of proof may be the most convincing of all." The last experiment having less of the deceptive about it is more easily understood, and clearly points out that all these experiments only go to prove that the frame on being turned once round, rotates upon its own axis, A, supposed to be the axis of the earth, the rotations of the ball, B, on its own axis, not being indicated by one or the other; it must therefore be plain that the conclusions drawn from these experiments are false in regard to the ball, B, and its rotations.

Let Mr. Hill and "Co." assert what they please as to the motions of celestial bodies while they remain in the clouds, but when they come down to earth, and attempt to show these motions by mechanical representations, we must not only have assertions, but rotations that can be indicated.

Bertram Mitford.

Northumberland Lodge, Cheltenham, March, 1860.

HOW IS VOLTAIC ELECTRICITY GENERATED?

Considerable mystery is acknowledged to exist as to the manner in which electricity is generated in the voltaic battery: by some it is said to be caused by chemical action, others suppose it is caused by contact of dissimilar metals, and each theory has its supporters. Some remarks in the March number of your *Journal* confirm an opinion long held by me, that it is produced in the same manner we *know* it to be in the common electrical machine—*by friction.*

When the liquid in the battery is exercising a chemical action on the zinc plate so powerful that it tears to pieces and gradually dissolves the solid metal, are we not warranted in concluding there is a violent friction of particles at the surface of that plate, although the friction be not visible to the eye? If this fact be admitted, observe the striking analogy between the galvanic battery and the common electrical machine: the zinc plate acts as the rubber, the badly conducting fluid takes the place of the glass cylinder, and the positive metal that of the prime conductor; again, connect the rubber with the earth, and the current will pass from the conductor through any conducting substance in contact with the earth; also, connect the rubber and conductor by a wire and the current passes. I look upon a voltaic battery as a series of electrical machines, the conductor of the one forming the rubber of the next.

As we decrease the conducting power of the cylinder, we increase the tension of the electricity. Is it not so with the voltaic battery? For instance, compare Crosse's water battery with the nitric acid one of Grove.

In your March number you state it to be probable that a quantity of electricity may be obtained by simple friction, by increasing the surface of the rubber, by the substance carrying the electricity from the rubber to the conductor, which is a bad conductor, and by placing the prime conductor in contact with the cylinder. All of these requirements, with the exception of the friction, are met in the galvanic battery, and this theory supplies the friction.

That violent mechanical action exists where we should least expect to find it, was accidentally discovered by Mr. Crosse, in his experiment where the continuous escape of carbonic acid gas from beneath a sovereign, wore away a portion of the rim.

Experiments might be tried for the purpose of ascertaining whether a current of electricity can be obtained from two plates of a similar metal, by submitting the surface of one of them to mechanical friction below the surface of a liquid. It should, however, be borne in mind that there is as much difference between atomic and mechanical friction, as between a chemical and mechanical mixture.

If by means of simple friction beneath the surface of a liquid, electricity can be produced possessing great decomposing power, a most important step will have been taken towards the solution of the problem, whether electricity is to supersede steam as a motive power.

William H. Harrison.

Electric Telegraph Co's. Office,
Haverfordwest, South Wales, April, 1860.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL SOCIETY.

At the recent *conversazione* of the President, Sir Benjamin Brodie, all the rooms of the Society in Burlington House were thrown open, and an unusually large collection of objects in science and art were exhibited. Among them were the extremely beautiful machine for weaving by electricity, invented by M. Bonelli; Mr. H. Bradbury's engraving machines, which were exhibited in action; specimens of the newly-invented process of photo-zincography, by Colonel James, director of the Ordnance survey; models of Mr. Whitworth's guns, and specimens of the actual shot used, explained by Mr. Whitworth; a very interesting series of portraits and relics of Dr. Priestley, including two of his electrical machines, exhibited by Mr. Bostock, the Rev. James Martineau, and Mr. Yates; Trevithick's original locomotive engine, exhibited by Mr. Woodcroft; curiosities from Japan, exhibited by Captain Sherard Osborn and Dr. Macgowan; model of an iron fortress, exhibited by Mr. Hall; and a very remarkable series of experiments showing electrical discharges in vacuo by the voltaic battery, by Mr. Gassiott. His Royal Highness the Prince Consort, attended by the Hon. Colonel Hardinge, arrived shortly before ten o'clock, and was engaged upwards of an hour in the inspection of the various interesting objects which abounded in the several rooms. A very numerous and distinguished company was present.

MARCH 1, 1860.

A list of candidates for election into the society was read: they amount to forty-nine. The following papers were read:—

"On the electrical phenomena which accompany muscular contraction," by Professor Matteucci.

"An inquiry into the muscular movements resulting from the action of a galvanic current upon nerve," by Dr. Radcliffe.

"Account of a thunder-storm which occurred in Brussels on the 19th of February last," in a letter from the British Minister at Brussels.

MARCH 15, 1860.

"Analysis of my sight &c.," by Mr. T. W. Jones.

"On the light radiated by heated bodies," by Mr. B. Stewart.

"On the luminous discharge of voltaic batteries, when examined in carbonic acid vacua," with experiments, by Mr. J. P. Gassiott.

MARCH 22, 1860.

"On the theory of compound colours, and the relations of the colours of the spectrum," by Mr. J. C. Maxwell.

"On the insulating properties of gutta percha," by F. Jenkins, Esq.

"On scalar and clinant algebraical co-ordinate geometry," by A. J. Ellis, Esq.

INSTITUTION OF NAVAL ARCHITECTS.

MARCH 1, 1860.

This was the inaugural meeting of a new and very promising society—professing to deal with a subject hitherto left a good deal to itself—when Sir John Pakington, Vice-President, gave his opening address. After this, the following business was proceeded with:—

"On the present state of the mathematical theory of naval architecture," by the Rev. Joseph Woolley.

"On the wave line theory," by Mr. Scott Russell.

"On the strength of iron ships," by Mr. John Grantham.

In the evening, the Earl of Hardwicke addressed the meeting, and the following papers succeeded his discourse:—

"On the connection between the mode of building iron ships and the ultimate correction of their compasses, by Professor Airy.

In the discussion following this paper, it was stated that Mr. Evans, R.N., Superintendent of the Compass Department of the Admiralty, had arrived at the conclusion that a steamer should be built with the head north, and a sailing vessel with the head south. The reason for this was fully explained.

"On chain cables," by Mr. G. W. Lenox.

MARCH 2.

On this occasion Mr. John Penn took the chair. The papers were—

"On the strength of iron ships," by Mr. W. Fairbairn.

"On experiments performed on board some of her Majesty's ships, in 1855, 1856-7, for the purpose of ascertaining the heights of their centres of gravity," by Mr. F. K. Barnes.

In the evening Mr. Scott Russell took the chair, when the papers were—

"On an improvement in the form of ships," by Mr. Joseph Maudslay.

"On an improved mode of building diagonal ships," by Mr. John White.

"On various means and appliances for economising fuel in steamships," by Mr. Robert Murray.

MARCH 3.

The Rev. Joseph Woolley in the chair.

"On the tonnage law as established in the Merchant Shipping Act of 1854," by G. Moorsom, Esq., Surveyor-General for Tonnage to the Board of Trade.

"On mechanical invention in its relation to the improvement of naval architecture," by Mr. N. Barnaby.

"On the wave line theory," by Mr. Scott Russell.

ROYAL SCOTTISH SOCIETY OF ARTS.

MARCH 26, 1860.

Mr. David Lindsay read (for Mr. John Gemmel, manager of the Galston Colliery) a description of a self-acting trap-door for mines, the door opening when the full truck strikes a bell crank, and shutting of itself when the truck has passed. The paper was illustrated by a model, and was characterised by the chairman as exceedingly useful and ingenious.

Mr. W. D. Hart laid before the meeting a communication, and exhibited an apparatus in practical operation for giving light by electricity in surgical and dental operations. This consists of a coil machine, with galvanic battery applied to a small vacuum tube, which being bent in a particular manner and the current of electricity passed through it, the point of the bent tube is immediately lighted up, and can be inserted in the mouth or any cavity where light is required. There is no need for reflectors. The shadow of the operator cannot interrupt the light, and there is no perceptible degree of heat, and no danger of scorching the patient. These tubes can be constructed of almost any shape and size, according to the nature of the operation required; and the colour of the light can be adapted to the same end by the introduction into the tube of different gases. The great value of the apparatus is its extreme ease of management, two small Bunsen batteries being sufficient to produce the light.

ASSOCIATION OF FOREMEN ENGINEERS.

JANUARY 7, 1860.

"On the scientific instruments used in the Kew Observatory," by Mr. Bickley.

FEBRUARY 4.

This was the adjourned half-yearly meeting, when Mr. Newton, in a speech of some length, announced his resignation of office as President; but, as it appears that the Association cannot by any means afford to lose him, he was eventually tempted to retain his chair.

MARCH 3.

"On the history of the iron trade," by Mr. Robertson.

MARCH 7.

"On turning and boring heavy guns," by Mr. W. Kyte.

INSTITUTION OF CIVIL ENGINEERS.

FEBRUARY 14, 1860.

"On the construction of artillery and other vessels to resist great internal pressure," by Mr. J. A. Longridge.

After the meeting, Mr. W. Strode, Assoc. Inst. C.E., exhibited and explained specimens of Messrs. M'Kenzie and Whitworth's breech-loading rifles.

MARCH 27.

"On combined steam," by the Hon. John Wethered, U. S.

APRIL 3.

Discussion on the Hon. John Wethered's paper "On combined steam."

APRIL 17.

"On the efficiency of various kinds of railway breaks, with experimental researches on their retarding powers," by Mr. W. Fairbairn.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

FEBRUARY 7, 1860.

"On the strength of iron ships," by Mr. W. Fairbairn.

"On the politico-economical doctrines respecting the causes which regulate the price of commodities," by the Rev. W. N. Molesworth.

"On the vestiges of extinct glaciers in the highlands of Great Britain and Ireland," by Mr. E. Hull.

MATHEMATICAL AND PHYSICAL SECTION.

FEBRUARY 2.

"On the eclipse of the sun, July 18, 1860," by Mr. W. L. Dickinson.

"On the moon's orbit plane," by Mr. Thomas Carrick.

FEBRUARY 21.

"On the life and writings of the late Henry Buckley," by Mr. T. T. Wilkinson.

MARCH 20.

The President, Mr. Fairbairn, exhibited two large pans of cast-iron, procured by Mr. Worthington from China, where they are used for boiling rice. The metal, which was at the strongest part only one-tenth of an inch in thickness, possessed considerable malleability. The President remarked that the art of making such large castings of thin metal was unknown in England.

"On the history of invention as applied to the dyeing and printing of fabrics. Part 2, mechanics," by John Graham, Esq.

GEOLOGISTS' ASSOCIATION.

THE ordinary monthly meeting was held on Monday, April 2—the Rev. T. Wiltshire, M.A., F.G.S., president, in the chair. Mr. Charlesworth, F.G.S., gave a lecture on "The Crag." Some of the members exhibited specimens of impressions of leaves from the London clay at Dulwich, near London, which had been procured during the progress of the excavations now being made for the purposes of the metropolitan main drainage.

It is the intention of the committee to conduct occasional excursions to places of geological interest, and the first of such excursions was made on the 9th ult., when a large number of members, under the guidance of the President and Professor Tennant, F.G.S., visited Folkestone, for the purpose of examining the geology of the district. The party left London by the excursion train, and returned the same evening, having been able to spend some hours on the shore, where they examined the chalk, greensands, and gault, and procured several of the characteristic fossils with which the place abounds.

ROYAL INSTITUTION.

FEBRUARY 3, 1860.

"On the mineral treasures of the Andes," by Mr. F. Field.

FEBRUARY 10.

"On species and races, and their origin," by Professor T. H. Huxley, F.R.S.

FEBRUARY 17.

"On the influence of science on the art of calico-printing," by Professor F. Crace Calvert, F.R.S.

MARCH 2.

"On the measurement of the chemical action of the solar rays," by Professor H. E. Roscoe.

"On lighthouse illumination—the electric light," by Professor Faraday.

"On the relation between the abnormal and normal formations in plants," by Maxwell T. Masters, Esq.

SOCIETY OF ARTS.

FEBRUARY 29, 1860.

"On building stones, the causes of their decay, and the means of preventing it," by Mr. G. R. Burnell.

FEBRUARY 15.

"On figure weaving by electricity," by Mr. P. Le Neve Foster.

MONTHLY NOTES.

MARINE MEMORANDA.

By the new arrangement of the details of the mail services between England and France, the journey between London and Paris will be accomplished in $10\frac{3}{4}$ hours, instead of 15 as hitherto, and very important conveniences as regards the despatch and arrival of the letters will be secured. To carry out these improvements the English Post-office will pay the South-Eastern Railway Company, for the acceleration of 30 minutes between London and Dover, about £6,000 per annum. The French Post-office will pay the Northern of France Railway Company about £4,000 per annum for accelerating their trains between Calais and Paris 40 minutes by night and $2\frac{1}{2}$ hours by day. Three hours and 40 minutes are allowed now for the French mails between the railway stations of Dover and Calais. Under the new arrangements 2 hours and 45 minutes only will be allowed. Mr. Churchward will also have to maintain an average rate of speed equal to 14 knots instead of his present contract speed (13 knots) to carry out successfully the English or night mail service. The chief inducement, therefore, to the contractor to improve his vessels and incur larger working expenses to carry out the projected public improvements was the extension of the term of the English contract to the same term as that for which he held the French contract. Mr. Churchward, under his new contract of April, 1859, has no increase of subsidy; the extra money beyond that of the 1855 contract is for those extra services and cost of service paid out of pocket by the contractor, and reimbursed to him in detail under the engagements of the old contract, and also for additional extra services. The small steam tender has been supplied, and has been worked at Calais. With very few exceptions, all the Indian mails homewards (Calais to Dover) have been conveyed by special packets, carrying no passengers at the time. The monthly outward mails to India, China, and Australia, have so increased in bulk and number of boxes, that a special packet is now despatched with those mails only, and without passengers, from Dover to Calais, another mail packet taking at the same time the ordinary mails and passengers. A new and more costly and powerful vessel than has ever before been placed on the station, the *John Penn*, is now fully engaged in performing the mail and special services, which require the quickest despatch.

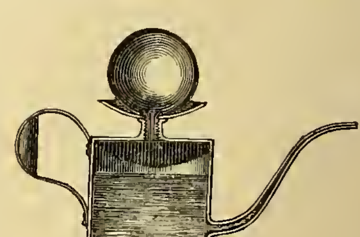
Messrs. Tod and Macgregor of Glasgow, have just completed a paddle steamer 200 feet long, 22 feet breadth of beam, and 11 feet depth of hold. The boilers are tubular surface condensers, and the diameter of the paddles is $17\frac{1}{2}$ feet. The steamer, which has been named the *Mona's Isle*, is intended for the Liverpool and Isle of Man station. The line of screw steamers, constructed for Messrs. Burns and MacIver, and intended for the Liverpool and Mediterranean trade, are now far advanced; in fact, two—the *Olympus* and *Marathon*—have already been a short time on the route. Three others will shortly follow. The steamers are all precisely alike, and the dimensions of one of them, the *Hecla*, will serve as a guide to the whole—length, 289 feet; beam, 36 feet; depth of hold, 27 feet. The engines are of 300-horse power, and from the fine lines of the steamers, they are expected to attain a high speed. A steam crane or hoist is supplied to each ship, and the apparatus can not only be applied to loading and unloading, but also to weighing the anchor and pumping. An iron screw steamer, named the *Carron*, 176 feet long, 26 feet beam, and $14\frac{1}{2}$ feet deep, with engines of 100-horse power, has just been launched by Messrs. Barclay, Curle, and Co., of Stobcross. The *Carron* is intended to trade with goods between London and Grangemouth, in connection with the Carron Company's fine fleet of steamers. The steamer *Balclutha* built by Messrs. Caird and Co., and intended for the Adelaide and Melbourne line, will leave shortly for the Australian seas. Five iron barges recently launched by Messrs. J. Reid and Co., of Port-Glasgow, and intended for the navigation of the Indus, are about to be sent out to Kurrachee, where they will be reconstructed.

Messrs. Rennie are about to construct, at their works at Greenwich, a monster iron floating dock for the Spanish Government, on a scale of sufficient magnitude to admit the largest line of battle ship. The dock will be 335 feet long, 110 feet wide, 45 feet deep, and 4000 tons of iron will be used in its construction. When completed, the dock will be forwarded to Cadiz in sections, and will then be fitted together for use. It will be constructed on the tubular system, so that it may be sunk in the water, and by the introduction of air be enabled to lift ships of large size.

The *Great Eastern*, it appears, is now really to be fitted for sea. Mr. Langley, of Deptford, the inventor of the steering gear used on her early trips, is busy upon her for this purpose. Messrs. Summers and Day, of the Northam Iron Works, Southampton, are executing the work.

DUPLEX FACE STOP-COCK.—A very simple and effective stop-cock has lately been proposed by J. P. Henderson, Esq., of Summerford House, Falkirk, as an improvement upon the common and defective class of valves. It mainly consists of two sectional portions of a valve chamber bolted, screwed, or otherwise attached together, to form a solid chamber. One sectional portion of this main shell forms the inlet from the source of supply, being formed with a horizontal pipe or thoroughfare for this purpose. The inner flange face of this portion is accurately faced up to form the inlet seat of the valve. The other sectional portion of the main shell is of a wider bore, and it forms the actual receiving chamber for the liquid, which passes off from it by a lateral and vertically descending pipe or discharge outlet. The front or outer end of this portion of the main shell is bored out in the centre, and screwed interiorly to receive a horizontal screwed spindle, which works through it as through a fixed nut. This spindle projects out of the shell, and is long enough to receive an actuating lever or other detail for turning it by; or instead of using a screwed spindle, a plain spindle may be adopted, to be worked by direct end-long pressure, or in any other convenient way. The inner end of this spindle is formed with an end flange or piston piece faced on its extreme outer end, with a disc of caoutchouc or other suitable material; whilst on its inner face, or that part which joins the spindle, there is a second elastic disc or annular facing piece. The outer disc, when the valve is closed, bears hard against the face of the inlet portion of the main shell, thus completely stopping the flow of water; whilst, when the spindle is drawn back, this elastic face is withdrawn from the stationary metal face, and the liquid flows into the receiving chamber, and thence away by the discharging branch. The object of the inner or secondary elastic disc is to prevent the liquid from flowing off past the actuating spindle, by coming up against a faced shoulder in that section of the main shell. In this way the elastic face action is duplex—that is to say, one such face action opens and closes the water way, whilst the other acts as a stuffing-box for preventing liquid escape during the discharge through the stop-cock.

PNEUMATIC OIL CAN.—Another application of that highly useful material vulcanised India-rubber, has been made by Mr. James Hunter, whose agricultural cultivator we have given in another part of our columns. The application we allude to, is that of one of the well known air balls, adapted to an oil can, as shown in the subjoined cut. The oil can is made with a cup-shaped top, in which the lower portion of an air-ball rests, this ball has fitted in it a small metal tube which is screwed into the tubular passage below the cup and leading into the can.



On the upper part of the ball there is a small hole for the admission of air. When the can is used the thumb is placed upon the aperture, and the ball is slightly pressed down, which causes the oil to flow from the spout, and on removing, or decreasing the pressure, still keeping the aperture closed, the further flow of the oil is arrested. The arrangement will doubtless be found very useful, and be duly appreciated in the workshop.

MANCHESTER ASSOCIATION FOR THE PREVENTION OF STEAM BOILER EXPLOSIONS.—At the monthly meeting of the executive committee, Mr. H. W. Harman, C.E., chief inspector, presented his report, of which the following are extracts:—"We have made 174 visits, examined 427 boilers, and 324 engines. Of these 4 visits have been special, 3 boilers specially, 389 externally, 15 internally, and 23 thoroughly examined; 7 cylinders have been indicated at ordinary visits. The principal defects met with during the month are as follows:—Fracture, 11 (1 dangerous); corrosion, 15 (1 dangerous); safety valves out of order, 30 (1 dangerous); water gauges, do., 6; pressure guages, do., 11; blow off cocks, do., 7; fusible plugs, do., 3; furnaces out of shape, 10; totals, 93 (3 dangerous); boilers without glass water gauges, 8; do. pressure gauges, 5; do. blow off cocks, 4; do. back pressure valves, 54. The remaining defects do not require to be particularised." The very valuable report of the year's doings of the association, lately issued under the auspices of Mr. Harman, ought to be carefully read by all who are interested in steam power.

WATSON'S GAS METERS AND EXHAUSTERS.—Mr. J. K. Watson, of the Edinburgh Gas Works, has lately contrived a new arrangement of gas meter, in which the revolving drum or cylinder is constructed in the ordinary manner of wet meter cylinders, but it has no external gas casing. Each side of the cylinder is formed with a convex cover or false end. The inlet pipe passes through the centre of this false end or cover on the inlet side, and is turned up to the required height in the interior in the usual manner. The gas passes through the cylinder, and is received into the corresponding cover or false end on the opposite side or end of the cylinder, which is fitted with a gas discharge pipe, in every way corresponding to the gas inlet pipe, the receiving end being turned up inside the cover, and then passed out by a central aperture. In this way the gas is both received and discharged at the centre of the cylinder. For large meters, such as for stations and large establishments, this apparatus may simply stand in an open vessel of water, filled with the fluid to the required height. But for domestic purposes, on the smaller scale, a cover is necessary, simply for screening the apparatus, but not for retaining the gas. As an exhauster, the apparatus is constructed in a precisely similar way, the cylinder being simply actuated by any suitable motive power so as to draw the gas into and force it out of it. The arrangement, or a modification of it, may also be applied to washers and wet lime gas purifiers.

Literary Progress.—The great lending library of Mr. Mudie, in Bloomsbury, London, has been gradually built up to such an eminent position, that its effects upon the progress of literature are now really felt as substantial facts of our times. In January, 1858, Mr. Mudie advertised his intention to increase the supply of books to his library for that and the following year to 100,000 volumes per annum. That intention has been fulfilled, more than 200,000 volumes having been added during the past and present seasons. The following classified list of works, placed in circulation since January, 1858, may be regarded with interest, as it indicates, to some extent, the relative circulation of works of various classes in our current literature:—History and Biography, 56,472 volumes; Travel and Adventure, 25,552; Fiction, 87,780; Miscellaneous, including Works of Science and Religion, and the principal Reviews, 46,250; total, 216,054. The present rate of increase exceeds 120,000 volumes per annum, consisting chiefly of works of permanent interest and value. Not many years ago, a library of 100,000 volumes was reckoned a great one, but here we have a public lending library, to which any one may resort, boasting its annual increase of above 120,000 volumes. The facts to which we have alluded, are not more curious for their illustration of the practical progress of literature, and the vast increase of the wares of the bookseller in our modern times, than for their exemplification of what well-directed mercantile ability can do for the dissemination—and with that dissemination—for a vast increase in the production of books, and the enormous benefits which the work derives from a well-spread flood of equally well-chosen literature.

Printing Fabrics in Imitation of Embroidery.—M. Perrot has recently discovered a novel mode of ornamenting fabrics by the printing process, so as to produce an effect similar to embroidery. This process consists simply in printing, by the aid of rollers, any desired pattern upon a fabric, in a solution of gutta percha, previously bleached by the aid of chlorine, and dissolved by any of the well-known solvents. The fabric so printed is then passed through a box or casing containing woollen, cotton, silk, or other fine flock or coloured powder, which adheres only to those parts impressed with the solution, and forms beautifully raised patterns and devices, having a fine, soft, and velvety surface. This process recalls to our mind a very similar system which was patented as far back as 1850, by Mr. Auchterlonie of Glasgow. Our readers will find a notice of Mr. Auchterlonie's system in our 3d vol., 1st series, at page 105, where they will be enabled to compare the two, and judge of their relative values. We have not seen any fabrics ornamented after M. Perrot's plan, but we inspected Mr. Auchterlonie's fabrics, and witnessed the process of ornamenting, and can speak with the greatest confidence of the success of the system.

Industrial Aspect of Perfumery.—The raw materials of our perfumery manufacture, really form a large item of the commerce of the present day. Perfumes are now largely made from sources very different from sweet scented flowers; but the natural perfumes of the field are still drawn upon for the purpose, to a marvellously large extent. The chief places of the growth of perfumery flowers are the South of France and Piedmont, namely, Montpellier, Grasse, Nimes, Cannes and Nice; these two last especially are the paradise of violets, and furnish a yearly produce of about 13,000lb. of violet blossoms. Nice produces a harvest of 100,000lb. of orange blossoms, and Cannes as much again, and of a finer odour. 500lb. of orange blossoms yield about 2lb. of pure Neroly oil. At Cannes the acacia thrives particularly well, and produces yearly about 9000lb. of acacia blossoms. One great perfumery distillery at Cannes uses yearly about 140000lb. of orange blossoms, 20000lb. of acacia blossoms, *(Acacia Farnesiana)*, 140,000lb. of rose leaves, 32,000lb. of jessamine blossoms, 20,000lb. of violets and 8000lb. of tuberoses, together with a great many other sweet herbs. The extraction of the etherial oils, the small quantities of which are mixed in the flowers with such large quantities of other vegetable juices that it requires about 600lb. of rose leaves to win one ounce of otto of roses, demands a very careful treatment. Science, of a high class, is indeed now very necessary for the successful prosecution of the manufacture.

Steel Wire in Steam Cultivation.—The following note on the great value of steel wire in steam ploughing tells its own tale. It is addressed to the makers, Messrs. Webster & Horsfall, of Birmingham:—

"I have great pleasure in stating that I consider your steel wire rope to be an invaluable substitute for the old rope made with *iron* wire. I consider that, uniting hardness with flexibility, it will bear four times the friction, and fully double the working load; and that on its introduction as a merchantable article has depended my success with the steam plough. John Fowler, Jr."

This is a curious instance of the manner in which simple and apparently insignificant matters often affect for better or for worse the greatest practical projects.

Each eradication of one old prejudice is a gain to science; and each vulgar opinion proved to be erroneous is an approximation to truth, which alone is worthy of being recorded for the use of mankind.—*John George Forster.*

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded October 26, 1859.

2449. John L. Prichard, Dowlais, Glamorganshire—A new method of relieving pain in the human body.

Recorded December 20.

2892. James Fairclough, Liverpool—Improvements in bed bottoms and other similar structures.

Recorded January 14, 1860.

102. William Barton, Shoreditch, and Frederick Ross, Clerkenwell—Ornamenting textile fabrics known as American cloth.

Recorded January 17.

121. Benjamin Burrows, Leicester—Improvements in looms for weaving narrow fabrics.

Recorded January 21.

160. Henri Landrin, Rue de Seine, and Louis J. Soule, Rue de Montholon, Paris—Improvements in washing ores and minerals.—(Communication from Henri C. Landrin, Portugal.)

Recorded January 23.

166. James Potter, Manchester—Certain improvements in self-acting mules.

Recorded January 27.

207. Poncon B. Jeandelize, Bonsecours, Rouen, France—An improved eye flap designed to stop horses which have taken fright, by depriving them of sight, and which he calls "blinding eye flap," for which he has obtained in France a patent for invention and improvement for fifteen years, bearing the date of the 19th August, 1859, No. 41,909.

Recorded January 30.

230. Montague Wigzell, Friars' Green, Exeter, Devonshire, and Eustice Wigzell, Marden Terrace, Lewisham Road, Greenwich, Kent—An improved form of land battery for coast and other fortifications.
234. Nathaniel J. Holmes, Hampstead, and James Gordon, Stoke-upon-Trent, Staffordshire—An improved method of purifying fluids or substances by electro-magnetism.

Recorded February 2.

268. William Ingham and William Hinchliffe, Armley, Yorkshire—Improvements in apparatus for applying steam and other vapours, gases, or fluids, to the production of motive power, and which may also be used for a pump or gas exhauster, or other similar purpose.
275. Samuel Chatwood, Cornwallis Street, Liverpool — Improvements in sewing or stitching machines.

Recorded February 4.

299. George A. Biddell, Ipswich—Improvements in projectiles.
304. William Spurrier, Birmingham, Warwickshire—Improvements in shaping metals and in machinery employed for that purpose.

Recorded February 6.

310. James E. Boyd, Hither Green, Lewisham, Kent—Improvements in carriages and other conveyances used for the conveyance of children, adults, and invalids.
311. Joseph Skertchly, Ashby-de-la-Zouch, Leicester—Improvements in apparatus for evaporating the moisture from slip for potters' use.

Recorded February 7.

318. Martyn J. Roberts, Crickhowell, Brecon—Improvements in breech-loading fire-arms.
319. William N. Wilson, High Holborn—Improvements in sewing machines and apparatus connected therewith.—(Partly a communication from Lucius Bigelow, Boston, U. S.)
320. John Whitehead, Preston, Lancashire—Improvements in moulding or shaping clay and other plastic materials, and in the apparatus employed therein.
322. Paul Chartroule, Boulevart St. Martin, Paris—Iodine inhaling means and apparatus for medical purposes.
324. Aime L. E. Breittmayer, Rue de Bruxelles, Paris—Improvements in machinery for, and in engraving the metallic surfaces of printing rollers or cylinders.
326. William E. Newton, Chancery Lane—Improvements in the fittings of sun-shades or roller blinds.—(Communication from Valbrus Drew, New York.)
328. Joseph R. Cooper, Birmingham, Warwickshire—Improvements in breech-loading fire-arms and ordnance.

Recorded February 8.

330. Alexander Dalgety, Shard's Terrace, High Street, Peckham, Surrey—Improvements of watches, clocks, and chronometers.
332. John M. Rowan, Glasgow, and Thomas R. Horton, Birmingham, Warwickshire—Improvements in steam engines and boilers.
334. Charles P. Moody, Corton Denham, Somersetshire—Improvements in carrying, supporting, and shifting engines used in ploughing and other agricultural operations, and in apparatuses employed therein.
336. John Miller, Fort, Ayrshire—Improvements in propelling vessels, ships, and boats.
338. George Whight, Ipswich, Suffolkshire—Improvements in sewing machines.—(Communication from Theodore S. Washburn, Rochester City, New York, U. S.)
344. James Cocker, Liverpool — Improved apparatus for indicating the number of passengers carried by public vehicles.
346. James Carver, Butcher Street Works, Nottingham—Improvements in the manufacture of combs used in pusher machines, for the making of lace or other articles and in the manufacture of counters used when casting the same.

Recorded February 9.

348. Charles Stuart, Halifax, Yorkshire—Improvements in machinery or apparatus for the manufacture of soles for clogs, shoes, and pattens.
349. John C. Lupton and Joseph Bleasdale, Church, near Accrington, Lancashire—Improvements in machines for preparing and spinning cotton and other fibrous materials.
350. Edward T. Hughes, Chancery Lane—Improvements in scouring wool, and in machinery or apparatus employed therein.—(Communication from Isaie Drubay, Cambrai, and Marie Mace, Fremont, Paris.)
352. Henry Deacon, Widnes, and Thomas Robinson, St. Helens, Lancashire—Improvements in the manufacture of soda.
354. George White, Dowgate Hill, Cannon Street—An improved machine for moulding candles.—(Communication from Messrs. J. Secger and Co., Esslington, Wurtemberg.)

Recorded February 10.

356. Thomas W. Rammell, St. Alban's Place, St. James's—Improvements in pneumatic railways and tubes.
357. Patrick Adie, Strand—Improvements in the means and spparatus for measuring angular snd actual distances.
358. John S. Dawes, Smethwick House, near Birmingham—An improvement or improvements in breech-loading fire-arms and ordnance.
359. David Auld, Glasgow—Improvements in machinery or apparatus for supplying steam boilers with water.
360. Thomas R. Yarrow, Arbroath, Forfarshire, and Walter M. Nellson, Glasgow—Improvements in steam engines and boilers.
361. Abel Earnshaw, Elias Graystone, James Shackleton, and William Steel, Keighley Yorkshire—An improvement in the spinning of wool, cotton, flax, alpaca, mohair, and other fibrous substances.
362. Benoit Bonnet, Salford, Lancashire—Certsin improvements in Jacquard apparatus to be employed in looms for weaving.
363. Henry Parrish, Balsall Heath, Worcestershire—An improvement in pressure gauges, the which is also applicable to vacuum guages.
364. George W. Bostock, George Street, Blackfriars Road, Surrey—Improved apparatus for taking the measure of the human body.
365. George A. Huddart, Brynkir, Caernarvonshire—Improvements in obtaining and applying motive power.
366. Daniel Wesson, Granby Street, Hampstead Road—Improvements in the manufacture of pianofortes.

Recorded February 11.

367. Henry D. Denison, Brunswick Street, Leeds, Yorkshire—Improvements in the construction of suspended weighing machines applicable to cranes and other lifting apparatus.
368. David Dietz, Boulevart de Strasbourg, Paris—An improved oil box for lubricating the axle-trees of railway carriages or waggons, applicable also to the shafts of all kinds of machines.
369. François Romeu, Paris—Improved hair pins.
370. William Aldred and John Maynes, Manchester—Improvements in apparatus applicable to steam boilers for liberating steam therefrom, either in the event of excessive pressure or of deficiency of water, for giving audible signals in the like cases, and for regulating the supply of water thereto.
371. William Nevill and Charles Bark, Godalming, Surrey—Improvements in the manufacture of fleecy web.
372. James Wright, Bridge Street, Blackfriars—Improvements in the construction of water-closets.—(Communication from Max Scholass, Stockholm, Sweden.)
373. Thomas Shedden, Ardgartan House, Argyllshire—Improvements in fire-arms.
374. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in sewing machines.—(Communication from Samuel Comfort, the younger, Morrisville, and Francis H. Jackson, Bristol, Bucks, Pennsylvania, U. S.)
375. Alexander Henry, Edinburgh—Improvements in apparatus for cleaning fire-arms.
376. Benjamin Purnell, Birmingham, Warwickshire—Improvements in hot water apparatus applicable to the heating of buildings, supplying baths and laundries, and other similar uses.
377. Alfred V. Newton, Chancery Lane—An improved construction of joints for railway bars or rails.—(Communication from George S. Avery, Cross River, Westchester, U. S.)
378. Edward Humphrys, Deptford, Kent—Improvements in marine steam boilers.
379. William Mitton and John Penney, Lincoln—Improvements in apparatuses employed for cleaning, dressing, winnowing, separating, and sifting grain and seeds aud such like matters.
380. William Harwood, Stowmarket, Suffolkshire—Improvements in machinery for reaping and mowing.
381. Richard J. Cole, Chepstow Villas, Bayswater—Improvements in the manufacture of lead and other materials for pencils.

Recorded February 13.

382. Henry Hewetson, Blackheath, Kent—Improvements in rockets.
383. Richard Telford, Birmingham, Warwickshire—Improvements in castors.
384. John C. Haddan, Bessborough Gardens, Pimlico—Improvements in the manufacture of guns and of projectiles to be used therewith.
385. William Readman, Leighton Buzzard, Bedfordshire—An improved apparatus for communicating motion to roller blinds, maps, and other articles.
386. John Green, Newton, St. Martin, Worcestershire—Improvements in machinery or apparatus for drilling and distributing or sowing broadcast lime, salt, soot, guano, and other manures.
387. Edouard Landsberg, Paris—Improvements in buttons, studs, or other similar fastenings for wearing apparel or other purposes.
388. Jean A. H. Ballande, Paris—An improved paper and ink for writing and printing purposes.
389. Thomas Shedden, Ardgartan House, Argyllshire—Improvements in the manufacture of cartridge cases for fire-arms, and in the arrangement of primers therefor.
390. Richard J. Cole, Chepstow Villas West, Bayswater—Improvements in the construction of brushes.
391. John Marsh, London Road, Nottingham—Improvements in sewing machines.
392. William Gossage, Widnes, Lancashire—Improvemeuts in the manufacture of certain kinds of soap.
393. Kanzow T. Bowley, St. Martin's-in-the-Fields, Westminster—An improved knee-cap for military, sporting, or other purposes.
394. William Clark, Chancery Lane—Improvements in apparatus used for stretching, drying, and finishing woven fabrics.—(Communication from Alphonse Delharpe, Tarare, Rhone, France.)
395. Lewis J. T. Howard and Lewis Howard, West Street, Green Street, Bethnal Green—Improvements in the fabric or material used for bolting or sifting flour and other matters.

Recorded February 14.

396. Samuel Copping, Tokenhouse Yard—Improvements in the manufactnre of coffins.—(Communication from John R. Cannon, New Albany, U. S.)
397. Daniel Nickols, Manchester—Improvements in machinery or apparatus for separating the fur from the skins of certain animals.
398. John Leach, Rochdale, and Thomas Clayton, Manchester—Improvements in pressing, ornamenting, and finishing woollen and other fabrics, and in the machinery or apparatus employed therein.
399. William Leatham, Leeds, Yorkshire—Improvements in the means or apparatus for governing steam engines.
400. James K. Worts, Colchester, Essex—Improvements in means or apparatus for obtaining motive power.
401. William Hunter, Sussex Place, Kensington—Improvements in apparatus for measuring and regulating the flow of gas as applied to compensating gas meters.
402. William E. Newton, Chancery Lane—Improved apparatus for producing an artificial draft in chimnies, and for purposes of ventilation.—(Communication from George Colhoun, Philadelphia, U. S.)
403. Pierre L. R. Mouillard, Bell Ysrd, Doctor's Commons—An improvement in the manufacture of metal chains and chain cables.
404. Joseph Arnold, Leys, Tamworth, Staffordshire—Improvements in the treatment of sewsge matters for the manufacture of manure, and in the apparatus for the same.
405. William Davis, Bankside, Surrey—Improvements in the manufacture of bread, and in apparatus applicable for the same.
406. Michael J. Haines, Stroud, Gloucestershire—Improvements in the manufacture of driving straps.
407. George T. Bousfield, Loughborough Park, Brixton, Surrey—Improvements in apparatus for separating impurities from grain.—(Communication from A. H. Dixon, Pearl Street, New York, U. S.)
408. Samuel Rowbotham, Putney, Surrey, and George H. Bolton, Penketh, near Warrington, Lancashire—A composite soap.
409. John Weeks, Marylebone—Improvements in umbrellas and parasols.

Recorded February 15.

410. William C. S. Percy, Manchester—Improvements in arrangements and mechanism or apparatus for the manufacture of bricks, tiles, pipes, and other articles formed of plastic materials.
411. Robert Morrison, Newcastle-upon-Tyne—Improvements in msrine steam engines and boilers.
412. James Ronald, Liverpool—Improvements in machinery for "topping up," "forming," or "laying twine," lines, cables, and other cordage.
413. George Wright, Ipswich, Suffolkshire—Improvements in winnowing and dressing machines.—(Communication from David E. Norton, Toronto, Canada.)
414. William F. Nuthall, North Lodge, Kilburn—An improved portable machine for correcting and boring rifle bullets, also for turning in shot cartridge cases.
415. Thomas Allen, Little Smith Street, Westminster—Improvements in window sashes.
416. Richard A. Brooman, Fleet Street—Improvements in the manufacture of fabrics suitable for carpets, hangings, furniture stuffs, and the like.—(Communication from Bernard Landwerlin, Dornach, near Mulhouse, and Theodore Dopff, Mulhouse, France.)
417. Gaetano Bonelli, Milan, Lombardy—Improvements in machinery for weaving figured fabrics.
418. John Hamilton, Glasgow, and Thomas Silver, Philadelphia, U. S.—Improvements in marine steam engines.
419. Josiah G. Jennings, Holland Street, Blackfriars, Surrey—Improvements in water-closets, urinals, and lavatories.

Recorded February 16.

420. Edwin Caplin, Islington—An improvemeut in the construction of soles and heels for boots, shoes, and other coverings for the feet.
421. Courtenay Sprye, St. Leonard's-on-Sea, Sussex—An improved self-feeding apparatus for printing machines.
422. Thomas Green, Nicholas Lane—An improved machine for the manufacture of paper and other bags.—(Communication from Leon de Pariente, Paris.)
423. George Parsons, Martock, Somersetshire—Improvements in steam engines.
424. William H. Elkin, Belvedere Road, St. Mary, Lambeth, Surrey—Improvements in window frames and sashes.
425. George Cowdery, Strood, Kent—An improved brick-making machine.
426. William Clark, Chancery Lane—Improvements in the mannfacture of gas and in apparatus for the same.—(Communication from Mr. Etienne C. Z. Bouchard, Paris.
427. William Clark, Chancery Lane—Improvements in sword and other sheaths or scabbards.—(Communication from Jean B. A. Jay, Boulevart St. Martin, Paris.)
428. Henry Widnell, Lasswade, near Edinburgh—Improvements in the manufacture of embossed cut pile fabrics.
429. John Hopkinson, New North Street, Finsbury—Improvements in machiuery for cutting paper.

Recorded February 17.

430. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in fire-arms.—(Communication from Eugene Lefancheux, Paris.)
431. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in furnaces for the prevention of smoke.—(Communication from Jules Poivret, Paris.)
432. William Hudson and Christopher Catlow, Burnley, Lancashire—Certain improvements in power looms for weaving.
433. James George, Birmingham, Warwickshire—A new or improved method of suspending gas and other chandeliers.
434. Edward Westwood, Brierley Hill, Staffordshire—An improved mode of securing or holding corks in the necks of bottles, jars, or other similar vessels.
435. Alfred Belpaire, Brussels, Belgium—Improvements in fire-boxes and other parts of locomotive and moveable steam engines.
436. Samuel Bury, Manchester—Improvements in machinery or apparatus for embossing and finishing textile fabrics or other like surfaces.
437. Thomas H. Morrell, Leyland, Lancashire—Improvements in apparatus used in moulding and pressing bricks, and in drying bricks, tiles, aud other articles made from plastic earths.
438. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in machinery or apparatus for twisting, doubling, and winding thread.—(Communication from Auguste Prouvost, Paris.)
439. Quiricus Filopanti, University Street—An apparatus for storing up the motive power of cheap or costless forces, and carrying their useful effects where no such cheap or costless moving powers could be applied.
440. Henry D. P. Cunningham, Bury, Hants—Improvements in reefing sails.
441. William Woodcock, Bessborough Gardens, Pimlico—Improvements in stoves.
442. David Irons, Hamilton Street, Deptford, Kent—Improvements in ships' compasses.
443. John Henry, Mitchell Street, Glasgow—Improvements in the manufacture of flounced dresses.
444. James Maude and Lorenzo Tindall, Sherwood Iron Works, Mansfield, Nottingham—A combined garden roller and seat.
445. Pierre Lavenas, Lyons, France—Improvements in obtaining motive power by compressed air and by its successive and ascending pressures, and in apparatus employed therein.—(Communication from Louis Brunier, Rue de la Charite, Lyons.)

Recorded February 18.

446. Pierre A. Gillis, Braine-le-Comte, Belgium—Au improved regulator for prime mover engines.
447. Pierre E. S. Dulos, Boulevart de Strasbourg, Paris—An improved process for engraving metallic surfaces either in relief or sunk lines, applicable to copper plates, presses, or to ordinary printing presses.
448. Joze Luis, Welbeck Street, Cavendish Square—An improved jointed blind.—(Communication from A. E. Tardy, Paris.)
449. Richard Bewley, jun., Brook House Foundry, Uttoxeter, Staffordshire—Improvements in the mode of heating the drying rooms, sheds, or stores used by potters and manufacturers of bricks and tiles.

450. John Sanders, West Bar, Sheffield, Yorkshire—Certain improvements in watches.
451. Michael Henry, Fleet Street—Improvements in the production of gas for lighting and heating, and in apparatus employed therein.—(Communication from Louis C. Bureau, Boulevart St. Martin, Paris.)
452. William E. Newton, Chancery Lane—Certain improvements in knitting machines.—(Communication from William H. M'Nary, Brooklyn, and James G. Wilson, New York, U. S.)
453. Edward Winter, New Oxford Street—Certain improvements in library and office tables.

Recorded February 20.

454. Thomas Osborne, Derby—Improvements in coupling and uncoupling railway and other vehicles.
455. Joseph Earnshaw and William Green, Preston, Lancashire—Improvements in machinery for forming blocks of wood into shape to be used as soles for boots, shoes, or clogs, or for other purposes.
456. John Moffat, Ardrossan, Ayrshire—Improvements in steam boiler furnaces.
457. Alexandre Teissere, Boulevart St. Martin, Paris—An improved blank stamping press.
458. William E. Newton, Chancery Lane—A new and useful improvement in the smelting and refining of iron.—(Communication from John B. Cornell, William W. Cornell, and Birdsall Cornell, New York, U. S.)
459. Thomas Hoyle, Marsden, Aldmonbury, Yorkshire—Improvements in the construction of screens employed for cleaning wheat and other grain.
460. Alfred C. Hill and William Morgan, Witton Park Iron Works, near Darlington—Improvements in protecting the sides and ends of puddling furnaces.
461. Frederick W. Mart, Gresham Street West, E.C.—Improvements in the manufacture of mops or "sponges" for cleansing cannon.
462. John Sowerby and Samuel Neville, Gateshead, Durham—An improvement in moulds for making pressed glass.
463. Richard A. Brooman, Fleet Street—Improvements in stamping presses.—(Communication from Theophile Canier and Adolphe Kunkler, Paris.)
464. G. W. Townsend, Calcutta—An improvement in projectiles.
465. Sir Charles T. Bright, Harrow Weald—Improvements in working and testing telegraphic conductors, and in apparatus connected therewith.

Recorded February 21.

466. Jean F. F. Leroux, Rue Volta, Paris—An apparatus for facilitating the collection of money on counters.
467. Pierre J. Weerts, South Street, Finsbury—Improvements in the preparation of stuffs in general.
468. Richard J. Derham, Redcliffe Street, Bristol—Improvements in butter churns.
469. Louis Sautter, Avenue Montaigne, Paris—Improvements in the treatment of mica and its application to the manufacture of reflectors, and to other uses.
470. Thomas Jackson, Orchard Street, Portman Square—Improvements in the action of upright piano-fortes.

Recorded February 22.

472. François H. Lemoine, Howland Street, Fitzroy Square—Improvements in the manufacture of waterproof papers and pasteboards of every description.
473. William H. Crispin, Marsh Gate Lane, Stratford, Essex—Improvements in fastenings for doors.
474. Charles Greves, Birmingham, Warwickshire—Improvements in fire-arms.
475. Christian Schiele, Lower Bebbington, Cheshire—Improvements in machinery for hammering, crushing, reducing, cutting, and mixing.
476. William E. Newton, Chancery Lane—Improvements in digestors for dissolving quartzose rocks.—(Communication from Timothy H Lang, New York, U. S.)
477. Victor E. Lecouper, Rouen, France—A new or improved system of filter.
478. Robert Davison, London Street—An improvement in boiling worts and other liquids.
479. William Symonds, Dunster, Somersetshire—An improvement in self-registering thermometers.
480. Samuel S. Bateson, Bolton Street, Mayfair—Improvements in generating steam and in heating apparatus, and in the apparatus employed therein.
481. Thomas Lovelidge, Philadelphia, Pennsylvania, U. S.—Improvements in looms for weaving.
482. Edward Wilkinson, Grimesthorpe, near Sheffield, Yorkshire—Improvements in sheep-shears.
483. Edward D. Reynolds, Southville, Bedminster, Bristol—An improved rifle ball.—(Communication from William Stow, Utica, Oneida, New York.)
484. Joseph H. Tuck, Great George Street, Westminster—Improvements in the manufacture of cylinders, tubes, and other hollow bodies.

Recorded February 23.

485. Pierre A. J. Dujardin, Lille, France—Improvements in printing telegraphs.
486. Daniel M Mapple, Clark's Place, Bishopgate Street Within—Improvements in electric clocks and electric batteries.
487. Thomas Barlow, Hill Top, West Bromwich, Staffordshire—A new or improved rail for railways.
488. William Haynes, Bank Place, Holywell, Flintshire—Improvements in obtaining metals from their ores or matrices.
489. William Charlesworth, Union Street, Southwark, Surrey, Henry Charlesworth, Barbican, and Thomas H. Dunbar, Clerkenwell—Improvements in cigarettes.
490. John Bottomley, Laister Dyke, near Bradford, Yorkshire—Improvements in means or apparatus used in spinning fibrous substances.
491. William F. Nuthall, North Lodge, Kilburn, and Charlea Humfrey, Southwark, Surrey—An improved lubricant for small arms and ordnance ammunition.
492. Samuel Gilbert, Coleorton, near Ashby-de-la-Zouch, Leicester—A new machine for excavating sewers, tunnels, and other such like under ground work.
493. Richard A. Brooman, Fleet Street—An improved method of producing documents suitable for bank notes and other instruments of value, in order to prevent forgery thereof.—(Communication from Leopold Eidlitz, New York.)
494. John Pegg, Leicester—Improvements in battens employed in weaving.
495. John Redfern, Cumberland Road, Southsea, Portsmouth, Hants—Improvements in the construction of steam boilers for increasing the durability thereof, and also for economising fuel.
496. Lippmann J. Levisohn, Helmet Row, St. Luke—An improvement in portmonnaies and certain other portable receptacles.

Recorded February 24.

497. François Boissan, South Street, Finsbury—Improvements in apparatus for the extraction of pit coal and other mineral products.
498. Thomas Dean, James Knowles, and Thomas Knowles, Manchester—Improvements in machinery or apparatus for obtaining motive power.
499. Edward Mucklow, Bury, Lancashire—Certain improvements in the treatment of madder roots, munjeet, or other plants of a similar class.
500. Samuel Roberts, Hull, Yorkshire—Improvements in steam engines.
501. James Thompson, Bilston, Staffordshire—Improvements in the manufacture of iron, steel-iron, and steel, and in the apparatus to be employed in such manufacture.
502. Joseph B. Howell, Sheffield, Yorkshire—Improvements in casing ships, batteries, and other structures for the purpose of resisting shot, shell, and other projectiles.
503. Robert Salisbury, Preston, Lancashire—An improved method of adapting sheds and other buildings to the purpose of drying pipes, tiles, bricks, and other articles made from clay or other plastic materials.
504. Richard A. Brooman, Fleet Street—Improvements in quills, spools, or bobbins.—(Communication from Stanislas Vigoureux, Reims, France.)
505. Jean J. Baranowski, Chalcot Terrace—Improvements in presses specially adapted to the copying of letters.
506. Seth Ward, Battersea, Surrey—Improvements in sewing machines.
507. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in the reduction of friction in the working parts of machinery, applicable also to the transmission of motive power.—(Communication from Ferdinand Schwenk, Vienna, Austria.)
508. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in forming the fastenings of caps or stoppers for jars and bottles, and on the machinery or apparatus employed therein.—(Communication from Thomas R. Hartell, Philadelphia, Pennsylvania, and Andrew K. Hay, Winslow, New Jersey, U. S.)
509. Andrew Barclay, Kilmarnock, Ayrshire—Improvements in pumping engines.
510. Conrad Wetter, Myddleton Square—Improvements in the manufacture of fermented and spirituous liquors.
511. William H. Walker, Leicester—Improvements in the manufacture of boots and shoes.
512. Thomas North, Oxford—Improved apparatus for receiving and recording votes by ballot.

Recorded February 25.

513. John Lightfoot, Accrington, Lancashire—Improvements in fixing pigments and other colouring matters on textile fabrics and yarns.
514. Edward T. Hughes, Chancery Lane—Improvements in boring apparatus.—(Communication from George Kolb, Bayreuth, Bavaria.)
515. Benjamin Annable and John Blench, Newcastle Street, Farringdon Street—Improvements in printing machines rendering the same more compact, of less bulk, and more available for use.
516. James Gillespie and John Gillespie, Kingsbarns, Fifeshire—Improvements in reaping and mowing machines.
517. William Dean and Charles Peach, Derby—An improvement in the manufacture of wreaths or trimmings for ladies' bonnets and other articles of dress.
518. Henry R. J. Denton, Leicester—Improvements in hay rakes, horse rakes, and similar agricultural implements.
519. Charles W. Siemens, Great George Street, Westminster—Improvements in the construction of electric telegraphic cables and conductors, and in the machinery connected therewith.
520. Ebenezer E. Scott, Dundee, Forfarshire—Improvements in and pertaining to breech-loading guns and fire-arms.
521. Thomas Lambert, Short Street, New Cut, and Obed Wakefield, Union Place, Lambeth, Surrey—Improvements in steam and other valves or cocks.
522. George Jenkins, Tyne Cottage, Hanwell—Improvements in childrens' metal cots or bedsteads.
523. James E. Boyd, Hither Green, Lewisham, Kent—Improvements in and transmitting motive power from certain parts to certain other parts of lawn mowing, grass cutting, and other agricultural, horticultural, and farming machines.
524. Charles E. Green, Blandford Street, Portman Square, and John Green, Charlotte Street, Porcland Place, St. Marylebone—Improvements in breech-loading fire-arms.
525. Samuel Varley, Birmingham, Warwickshire—A new or improved chain, and machinery to be employed in the manufacture of the said chain.
526. John Lang and Charles Chevalier, Submarine Telegraph Works, Birkenhead—Improvements in targets.
527. Thomas Silver, Philadelphia, U S., and John Hamilton, Glasgow—Improvements in apparatus for governing or regulating the speed of steam and other engines and machines in motion.
528. William Birks, sen., and William Birks, jun., Nottingham—Improvements in machinery for the manufacture of bobbin net or twist lace.
529. Joseph Lee, Lincoln—Improvements in the manufacture of crank shafts from round or square iron or steel.
530. Charles F. J. Fonrobert, Berlin, Prussia—Improvements in gilding and silvering silk and other fibrous substances.—(Communication from Mrs. Muller, Berlin, Prussia.)
531. Johann Faber, Stein, near Nuremberg—Improvements in ever pointed pencil cases

Recorded February 27.

532. John B. Rowcliffe, Ducie Works, Manchester—Improvements in pin winding machinery.
533. Robert G. Lowndes and James Gilroy, Auldhousefield, Renfrewshire—Improvements in embossing and finishing woven fabrics.
534. Alexander Melville, George Street, Portman Square—Improvements in the preparation and manufacture of compounds for marking on paper and other fabrics and substances.
535. Robert B. Cooley, Nottingham—Improvements in the manufacture of plain or ornamental woven or looped fabrics from certain descriptions of yarn, and for the application of such fabrics to the making of various articles of dress, and for other uses such as hats, caps, gloves, hosiery, lace shawls, mantle and other cloths, curtains, table, umbrella, and other covers, such fabrics being made with or without terry, plush, or cut pile surfaces.
536. Thomas C. Eastwood, Bradford, Yorkshire—Improvements in means or apparatus for preparing and combing wool, cotton, and other fibres.
537. Peter H. Desvignes, Lewisham, Kent—Improvements in apparatuses for exhibiting photographic, stereoscopic, and other pictures, models, figures, and designs.
538. Sydney F Shore, Clifton Hall, Derby—An improvement in or addition to casks to prevent their becoming foul.
539. John A. Bassett, Salem, Massachusetts, U. S.—Improvements in apparatus for decomposing steam.
540. William Munslow and Henry Wallwork, Miles Platting, near Manchester—Improvements in weighting and clearing rollers used in machinery for preparing and spinning cotton and other fibrous materials.
541. John A. Basset, Salem, Massachusetts, U. S.—Improvements in the manufacture of gas for illuminating and other purposes.

Recorded February 28.

542. Robert Walker, Eccleston, near Prescot, Lancashire—Improvements in apparatus for preventing accidents in winding from mines, which apparatus is also applicable for other similar purposes.
543. Edouard I. Asser, Amsterdam, Netherlands—A process of photographic proofs with printing or autographic ink for the purpose of either using them as such, or placing them back on lithographic stones or on metal.

544. Zaccheus Wright, Upper Wortley, near Leeds, Yorkshire—Improvements in machinery or apparatus for the prevention of accidents in mine shafts by the breaking of the rope or chain, or disconnection of the drum from the engine, applicable also to other hoisting or lifting machinery or apparatus.
545. William Davies, Queen's Road, Everton, near Liverpool—Improvements in moveable window shutters.
546. George Weir, Glasgow—Improvements in regulating steam engines, and in regulating apparatus for steam engines and other prime movers.
547. James W. Midgley, Keighley, Yorkshire—Improvements in machinery for spinning wool, mohair, alpaca, and other fibrous substances.
548. Hatsel Higgins, Orleans, Massachusetts, U. S.—Supporting the fluke of an anchor and discharging the same from the bulwark rail of a vessel.
549. Magnus Manson, Edinburgh—Improvements in gas meters.
550. Cornelius Paris and Joseph Lang, Preston, Lancashire—Improvements in looms for weaving.
551. Alban Anderson, Lancaster, Ohio, U. S.—An improvement in governors of motive power engines.

Recorded February 29.

552. Patrick F. Lynch and John Tynan, Liverpool—Improvements in the construction of boats, and in the use or application of certain novel arrangements and apparatus thereto.
553. John Blair, Caledon Mill, Manchester—Certain improvements in machinery for preparing and carding cotton and other fibrous materials.
554. Benjamin Hargreaves and James Heaton, Habergham Eaves, near Burnley, Lancashire—Certain improvements in looms for weaving.
555. John Rickard and William Rickard, Derby—Improvements in the manufacture of chenile and other piled fabrics, and also in the machinery connected therewith.
556. John M. Bryden and William C. Bryden, Edinburgh—Improvements in mountings for window blinds.
557. William Williams, Merthyr Tydvil—Improvements in machinery or apparatus for effecting ventilation.
558. George Ranken, Bathurst, Sydney, New South Wales—Improvements in paddle wheels.
559. Henry Swan, Bishopsgate Street Without—Improvements in stereoscopes, stereoscopic pictures, and cameras for taking the same.
561. John K. Smythies, Kensington Park Gardens, St. Mary Abbott's, Kensington—A flying engine.
562. William E. Newton, Chancery Lane—Improved machinery for making or forming the teeth of combs.—(Communication from William Noyes, jun., West Newbury, Essex.)
563. George Wilson, York—Improved machinery for moulding the caps of bottles and jars.
564. Robert H. Collyer, Alpha Road, St. John's Wood—Improvements in the manufacture of pulp, and in preparing materials for the purpose, and in apparatus employed therein, part of the invention being also applicable to preparing materials for fibrous and textile manufacturing purposes.

Recorded March 1.

565. Pierre C. D. Destas, Rue de Reuilly, Paris—A new engine working by wind or water.
567. Bashley Britten, Sydenham Hill, Kent—Improvements in projectiles.
568. William Bush, Dulwich, Surrey—Manufacturing granulated seidlitz powder.
569. William Clark, Chancery Lane—Improvements in machinery for "sizing" raw silk or other threads, and for cleaning the same preparatory to the sizing operation.—(Communication from Messrs. John E. Atwood, Mansfield Center, Tolland County, and Lewis Leigh, Seymour, New Haven County, Connecticut, U. S.)
570. Ive Bonnet and John D. Heid, Brussels, Belgium—Improvements in planing machines for files and other metal objects, straight, curved, or otherwise.
571. John Milnes, Gloucester—An apparatus for exercising the joints and muscles of the human body.
572. Jeremiah Driver, Keighley, and Joseph Jessop, Bradford, Yorkshire—Improvements in means or apparatus used in washing, wringing, and mangling fabrics.
573. David Chadwick, Salford, Lancashire, and Herbert Frost, Manchester—Improvements in apparatus for measuring water and other liquids.
574. John M'Culloch, San Francisco, U. S.—Improvements in the reduction of gold, silver, and copper ores.
575. James Collins, Bennett Street, Stamford Street—Improved outside blinds and awnings.
576. William H. Nash, Matsons Terrace, Kingslands Road—Improvements in steam engines.
577. John M. Blashfield, Stamford, Lincolnshire—Improvements in burning pottery and china ware, and in kilns employed for such purposes.
578. Henry Bessemer, Queen Street Place, New Cannon Street—Improvements in machinery or apparatus employed in the manufacture of malleable iron and steel.
579. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in gas regulators or governors.—(Communication from Adolphe Christophe, Paris.)

Recorded March 2.

580. George Edwards, Park Road Villas, Battersea, Surrey—Improvements in caissons and foundations for bridges, piers, and other structures under water.
581. Pierre M. T. O. C. Albites, Rue Vivienne, Paris—Improvements in photographic apparatus.
582. Benjamin G. Babington, George Street, Hanover Square—Improvements in means or apparatus for protecting the throat and chest from atmospheric influences, and which may also be employed as a protection to the mouth.
583. Roland d'Argy, Blois, France—Improvements in apparatus for raising water.
584. Joseph W. Lewis, Coventry, Warwickshire—Improvements in looms for weaving ribbons.
585. Richard A. Brooman, Fleet Street—Improvements in the construction of naves or bosses for wheels.—(Communication from Gustave Hamoir, Saultain, France.)

Recorded March 3.

586. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in the manufacture of artificial fuel.—(Communication from Elijah D. Williams and John R. Bostick, Philadelphia, Pennsylvania, U. S.)
587. Joseph Eccles, Blackburn, Lancashire—Improvements in machinery for the manufacture of bricks, tiles, pipes, and other articles formed of plastic materials.
588. Xavier Musty, Boulevart St. Martin, Paris—An improved apparatus for washing ores.
589. William G. Ramsden, Liverpool—An improved boiler or apparatus for generating and superheating steam, or heating water and other fluids under pressure.
590. William Bauer, Munich, Bavaria—Improvements in apparatus for diving and for raising and lowering bodies in water, parts of which improvements are also applicable to other useful purposes.
591. Warren S. Hale, Queen Street, Cheapside—An improved candle lamp.
592. William E. Gedge, Wellington Street South, Strand—A liquid or novel preparation to be applied to wools.—(Communication from Jules J. Desmares, Vire, France.)
593. William H. Muntz, Millbrook, Hants—Improvements in the construction of ferry boats.
594. Christian Schiele, Lower Bebbington, Cheshire—Improvements in obtaining and applying motive power from ocean and other waves.
595. Henry Humphrys, Deptford, Kent—Improvements in marine boiler furnaces and in feeding the same.

Recorded March 5.

596. Joseph Broel, Manchester—Certain improvements in the manufacture of soap.—(Communication from A. B. Devine, New York, U. S.)
597. John Sidebottom, Broadbottom, near Mottram, Cheshire—Certain improvements in looms for weaving.
598. Cyrus Price, Wolverhampton, Staffordshire—Improvements in locks and latches.
599. Richard Smith, West Street, Glasgow—Improvements in the preparation and production of colouring matter.
600. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—An improved ruffle and sewing machine for producing the same, applicable also to ordinary stitching.—(Communication from George B. Arnold and Abbey H. Price, New York, U. S.)
601. William N. Wilson, High Holborn, and James Pitt, Cleckheaton, Yorkshire—Improvements in apparatus for sewing machines.
602. Thomas W. Ashby and John Coulson, Stamford, Lincolnshire—Improvements in thrashing machines, part of which is applicable to cranks.
603. Richard A. Brooman, Fleet Street—Improvements in the manufacture of pipes for smoking.—(Communication from Auguste Bourrel, Paris.)
604. William Bridges, Birmingham, Warwickshire—Improvements in the manufacture of elastic bands.
605. James Howard, Bedford—An improvement in the construction of horse rakes.
606. William E. Newton, Chancery Lane—Certain improvements in window sashes.—(Communication from Thomas Fry, Brooklyn, King's County, New York, U. S.)

Recorded March 6.

607. Edward Field, Hart Street, Bloomsbury—Improvements in the manufacture of railway tyres.
608. Thomas Cox, the younger, and William Holland, Birmingham, Warwickshire—An improvement or improvements in the manufacture of the stretchers of umbrellas and parasols.
609. John Leeming, Bradford, Yorkshire—Improvements in looms for weaving.
610. William E. Gedge, Wellington Street South, Strand—An improved machine for drying fecula.—(Communication from Michel A. F. T. de Menonville, Rambervillers, Vosges, France.)
611. William E. Gedge, Wellington Street South, Strand—Improved machinery or apparatus for washing fecula.—(Communication from Michael A. F. T. de Menonville, Rambervilliers, Vosges, France.)
612. William E. Gedge, Wellington Street South, Strand—Improvements in lathes.—(Communication from Frederick G. P. Deloutte, de Vouziers, Ardennes, France.)
613. William E. Gedge, Wellington Street South, Strand—Improvements in the manufacture of lasts and boot trees.—(Communication from Auguste N. Jacquier, Paris.)
614. John Walsh, Stedalt, Balbriggan, Ireland—Improved machinery for cutting, tearing, crushing, or otherwise preparing for various useful and economical purposes furze or gorse, straw, bean-baulms, turnips, bark, flax, or any other vegetable substances.
615. Pierre Hugon, Paris—Improvements in obtaining and applying motive power.
616. William Buxton, Staveley, Derby—Improvements in safety cages for mines.
617. Robert Pitt, Newark Ironfoundry, Bath, Somersetshire—Improvements in the manufacture of leather, and in machinery for that purpose.
618. William R Jeune, Flower Terrace, Campbell Road, Bow—Improvements in fire-lighters.

Recorded March 7.

619. George Walcott, Abchurch Lane—An improved receptacle or receptacles for generating gas.
620. James Arnot, Birmingham, Warwickshire—A new or improved spindle for door and other knobs.
621. Edward T. Hughes, Chancery Lane—A hydro-dynamical re-acting rotatory steam engine.—(Communication from William H. C. Voss, Stuttgart, Wurtemberg.)
622. Edward Billington, Manchester—Improvements in machinery for combing cotton, wool, flax, tow, silk, waste, and other fibrous substances.
623. Charles A. Chapuis, Boulevart St. Martin, Paris—A new or improved process in manufacturing and ornamenting ceramic products chemically.
624. Arthur Paget, Loughborough, Leicester—Improvements in knitting machinery.
625. John Imray, Bridge Road, Lambeth, and James Copeland, Marlborough Place, Kennington, Surrey—Improvements in steam and other hammers and anvils.
626. William Beardmore, Deptford, Kent, and William Rigby, Glasgow—Improvements in steam engines.

Recorded March 8.

627. Christophe F. Delabarre, Neuilly, Paris—Improved apparatus to be used in propelling gases and forcing liquids.
628. William Goddard, Park Hall, Caverswall, Staffordshire—An improvement in railway chairs.
629. Thomas Veal, Willenhall, Staffordshire—Improvements in curry combs.
630. Moses Barton, Josiah Shepherd, and Thomas Evans, Nottingham—Certain improvements in the method of and apparatus for supplying and heating air, the same to be used as a motive power for marine, locomotive, and stationary engines.
631. George H. Birkbeck, Southampton Buildings, Chancery Lane—Improvements in floating docks.—(Communication from William Wain, Copenhagen, Denmark.)
633. John Bell, Manchester, and William Cutts, Salford, Lancashire—Improvements in steam engines.
634. William Palliser, Comragh, Waterford—Improvements in breech-loading rifles and other guns, and in cartridges to be used with such like fire-arms, also in shot used with rifled guns.
635. George Shearman, Haggerston—Improvements in water gas meters.
636. George Spiller, Upper Southwick Street—Improvements in knapsacks.
637. John Napier, Glasgow—Improvements in steam engines.

Recorded March 9.

638. Joshua Lister and John Lees, Oldham, Lancashire—Improvements in the construction of oil cans.
639. William Richards, Canning Street, Nottinghamshire—Cleansing, rinsing, or scouring lace, hosiery, or other articles, whether made of silk, cotton, or other material from extraneous matter.
640. Catherine Sheldon, St. George's Place, Great Hampton Row, Birmingham, Warwickshire—Certain improvements in ornamenting spurs, and other metal portions of saddlery and harness furniture, and which said improvements are also applicable for ornamenting other fancy articles made of wrought or cast metal.

641. Charles F. Bielefeld, Gower Street—Improvements in the manufacture of wads for guns, and in cases for containing the charge of powder for the same.
642. Joseph Sawer, London—Improvements in the the construction of furnaces for steam boilers and other purposes.
643. William Clay, Liverpool—Improvements in the manufacture of gun barrels, cannon, and other ordnance.
644. William E. Newton, Chancery Lane—An improved mode of attaching tools to handles.—(Communication from James E. Emerson, San Francisco, California, U. S.)
645. Thomas Smith, Manchester—Improvements in machinery or apparatus for ornamenting woven fabrics.

Recorded March 10.

646. Joze Luis, Welbeck Street, Cavendish Square—An improved calcareous varnish for coating wood, metals, paper, ships, and other substances.—(Communication from Jean F. J. Lecocq, Cherbourg, France.)
647. Joze Luis, Welbeck Street, Cavendish Square—An improved means of blasting rocks.—(Communication from Charles H. H. Lepetit, Cherbourg, France.)
648. Joze Luis, Welbeck Street, Cavendish Square—An improved mechanical damask loom.—(Communication from Philippe J. Galvaire, Arras, Pas de Calais, France.)
649. John S. Ottley, Eversholt Street, Oakley Square—An improved indicator for registering the withdrawal of liquids from casks or other vessels.
650. John H. Young, Great College Street, Camden Town—Improvements in setting up (composing) and distributing types.
651. James Rae, New Cross, Kent—Improvements in constructing iron ships, part of which improvements is applicable to the riveting of boiler plates and others.
652. William Ullmer, Castle Street, Holborn—An improvement in printing machines.
653. Timothy Morris, Birmingham, Warwickshire—Improvements in voltaic batteries and in vats used in depositing metals by electricity.
654. Frederick A. Pope and Richard F. Woodward, Birmingham, Warwickshire—Improvements in connecting brooms and brushes to their sticks or handles.
655. John Pilling, Colne, Lancashire—Improvements in brakes or apparatus for stopping looms when the shuttle is caught in the warp, which is applicable to all looms with a brake applied to them.
656. Marie J. E. Jullienne, Boulevart St. Martin, Paris—An improved bath belt, to be applied in the bathing vessels and in electrical apparatus connected therewith.
657. William Tuxford, Upper Thames Street, and George W. Hills, Morthlake, Surrey—Improvements in furnaces.

Recorded March 16.

659. Joseph B. Howell, Sheffield, Yorkshire—Improvements in tubes for boilers.
660. George Davies, Serle Street, Lincoln's Inn, and St. Enoch Square, Glasgow—Improvements in steam boilers and engines.—(Communication from Pierre Verrier, Marseilles, France.)
661. John Lankman, Stonehouse, Devonshire—An improved cartridge and method of manufacturing the same.
662. Alfred V. Newton, Chancery Lane—Improvements in steam engines.—(Communication from Henry Waterman, New York, U. S.)
663. Thomas W. Ashby and Thomas Yorke, Stamford, Lincolnshire—Improvements in the construction of haymaking machines.
664. William E. Newton, Chancery Lane—Improved machinery for making hat-bodies.—(Communication from S. B. Tobey, Providence, Rhode Island, U. S.)

Recorded March 13.

665. Martin Mangles, Abchurch Yard, Cannon Street, E. C.—A new mode of applying gases so as to effect the purifying and bleaching oils and fats, purifying, disinfecting, and deodorising fæcal and decomposing matter, and the gaseous products of decomposition, decomposing deleterious gases, purifying and decolouring soap, preparing flax and other fibres, treating blood, night soil, bones, and other substances, whether solid, liquid, or gaseous.
666. William E. Gedge, Wellington Street South, Strand—Improvements in apparatus for washing or dressing ores and analogous substances.—(Communication from A. Dufournel, Vassy, Haute Marne, France.)
667. Spencer Smith and Philip Hathaway—Improvements in the manufacture of chains and other similar articles.
668. James Wright, Bridge Street, Blackfriars—An improved method, means, and process of treating wool, so that it becomes so changed as to be well adapted for uses for which it is naturally unfit.—(Communication from Philander Shaw, Boston, Massachusetts, U. S.)
669. Marmaduke Miller and John Kemp, Mount Street, Nottingham—Improvements in water and steam gauges for steam boilers.
670. Alfred V. Newton, Chancery Lane—An improved construction of churn.—(Communication from Edward Lynch, Buffalo, Eyre, New York, U. S.)

Recorded March 14.

672. Joze Luis, Welbeck Street, Cavendish Square—A pneumatic telegraph.—(Communication from Pierre Richarme, Rive de Gier, France.)
673. Charles Batiste, Toulouse, France—An improved wood grooving machine.
675. Michael Henry, Fleet Street—Improvements in the construction of artificial hands, feet, limbs, or substitutes for natural hands, feet, and limbs, and parts thereof.—(Communication from Jose Gallegos, Boulevart St. Martin, Paris.)
676. Salomon Hecht, Gresham Street—A new mode of advertising on articles of earthenware, pottery, and the like, in general use.
677. James Sim, Aberdeen, North Britain—Improvements in measuring and registering the flow and discharge of liquids.
678. James Sim, Aberdeen, North Britain—Improvements in meters or apparatus for measuring fluids.
679. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in cleaning rice and the machinery or apparatus employed therein.—(Communication from Silas Dodson, San Francisco, California, and Alpheus Fobes, New York, U. S.)
680. Isaac Horton and Isaiah Kendrick, Southwark, Surrey—Improvements in steam boilers.
681. William T. Cheetham, Rochdale, Lancashire—Improvements in cocks or taps.
682. John A. Hopkinson, Huddersfield, Yorkshire, and Alfred Ridings, Bolton-le-Moors, Lancashire—Improvements in steam boilers and engines, and in apparatus connected therewith.
683. Alfred V. Newton, Chancery Lane—An improved construction of nail plate feeder.—(Communication from John W. Hoard and Thomas A. Serle, Providence, Rhode Island, U. S.)

Recorded March 15.

634. Johann E. F. Ludeke, Wolverhampton, Staffordshire—Improvements in obtaining motive power by means of certain fluid bodies, and in the apparatus connected therewith.
635. Thomas Wilson, Birmingham, Warwickshire—Improvements in breech-loading fire-arms.
636. Charles H. Shearman, South Belgravia—Improvements in steam engines.
687. Michael Henry, Fleet Street—Improvements in twisting fibrous materials, and in apparatus employed therein.—(Communication from François Durand and Henry A. Pradel, Paris.)
688. William M. Pattison, Frelighsburg, Missisquoi, Canada—Improvements in fountain pens and fountain penholders.
689. John Shields, Perthshire, and Alexander Shields, Cromwell Park, Perthshire—Improvements in Jacquard looms or machinery for weaving.
690. Bernard Lauth, Manchester—Improvements in machinery or apparatus for rolling railroad rails, bars, beams, and other such articles.—(Communication from John Fritz, Johnstown, Pennsylvania, U. S.)
692. Marc A. F. Mennons, Rue de l'Echiquier, Paris—An improved metallic window sash.—(Communication from François Cure, Paris.)
693. George Sturrock, Chatham, Kent—Improvements in revolving fire-arms.

Recorded March 16.

696. Robert B. Sayer, Newport, Monmouthshire—Improvements in parts of the permanent way of railways.
697. William Hudson and Christopher Catlow, Burnley, Lancashire—Certain improvements in power-looms for weaving.
699. William Wield, Manchester—Improvements in machinery for winding yarn or thread on to bobbins, spools, or other similar surfaces.
700. John Laird, Port-Glasgow, Renfrewshire—Improvements in effecting the exhaustion of steam engine condensers.
701. George A. Huddart and Joseph D. E. Huddart, Brynkir, Cærnarvonshire—Improvements in obtaining and applying motive power.
702. William Wood, Monkhill, near Pontefract, Yorkshire—Improvements in the manufacture of fibrous yarns and fabrics of cotton, flax, wool, or other material.
703. Thomas Richardson, Newcastle-on-Tyne—Improvements in treating organic and other substances, containing phosphate of lime.
704. James Nixon, St. Peter's Quay, Newcastle-upon-Tyne—Improvements in the manufacture of hyposulphite of soda.
705. John Reynolds, jun., New Compton Street, Soho—Improvements in the manufacture of wire or metal netting, and in machinery employed therein.

Recorded March 17.

707. Edward Cope, William Cope, and William G. Ward, New Basford, near Nottingham—Improvements in the manufacture of fabrics in lace machinery, and in the means or apparatus employed therein.
708. Richard A. Brooman, Fleet Street—Improvements in machinery for dressing warp threads.—(Communication from Jean V. A. Ruze, Gaillon, France.)
709. Richard Briggs, Birmingham, Warwickshire—A new or improved washing machine.
710. Peter Brotherhood, Chippenham, Wiltshire—An improved method of generating steam in locomotive, stationary, marine, or any other form of steam boiler.
711. William Clark, Chancery Lane—Improvements in the application of paper to filtering fluids.—(Communication from Messrs. Gustave Devillepoix and Joseph F. Bouneterre, Paris.)
712. Thomas Richardson, Newcastle-on-Tyne, and Manning Prentice, Stowmarket—Improvements in the manufacture of hydrated oxides and salts of iron, and salts of the fixed alkalis.
713. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in apparatus for controlling refractory horses.—(Communication from Henry Crane, New York, U. S.)

Recorded March 19.

714. William Hodgson and Henry Hodgson, Bradford, Yorkshire—Improvements in means or apparatus for preparing and spinning fibrous substances.
715. John Ellis, William Winterbottom, and John Bradock, Droylsden, Lancashire—Certain improvements in or applicable to steam engines.
716. Thomas Goldie, Airdrie, Lanarkshire—Improvements in looms for weaving.
717. William Clark, Chancery Lane—Improvements in tanning hides.—(Communication from Mr. Wilhelm Martz, Boulevart St. Martin, Paris.)
718. Charles F. Bielefield, Gower Street—Improvements in the fabrication of plastic materials pressed in moulds for building and ornamental purposes, and for statuary.
719. John H. Heal, Tottenham Court Road—Improvements in spring matresses.

Recorded March 20.

720. Perceval M. Parsons, Arthur Street West, London Bridge—Improvements in fire-arms and in projectiles to be used therewith.
721. John Williamson and Francis Williamson, Griffe Mill, near Keighly, Yorkshire—Improvements in looms for weaving.
722. John J. Cole, Essex Steeet, Strand—Improvements in chimneys.
723. James Aspell, Middleton, Edward Booth, and James Hurst, Tonge, near Middleton, Lancashire—Certain improvements in power looms for weaving.
724. Edward Gardner, Maidstone, Kent—Improvements in apparatus for the manufacture of paper.
725. Thomas Law, Uppingham, Rutland—Improvements in reaping and mowing machines.
726. Alexander Shand, Liverpool—Improvements in preparing or bleaching coir fibre and coir yarns.—(Communication from Charles Shand, Colombo, Ceylon.)
727. Edward Finch, Chepstow—Improvements in constructing railway switches and crossings.
728. John Brown, Norwich, Norfolkshire—Improvements in window-sashes, frames, and doors, in order to render them when closed, air, dust, and water-tight.

Recorded March 21.

729. James Newhouse, Farnworth, near Bolton-le-Moors, Lancashire—Certain improvements in machinery for preparing, spinning, and doubling cotton, and other fibrous materials.
730. John I. Taylor, Cottage, Botanic Gardens, Sloane Street—Improvements in apparatus for the manufacture of gas from oil and oleaginous substances.
731. Jean A. Herbert, Guildford, Surrey—Manufacturing of oxychloride of lead—(Communication from Ludwig Brumleu, New York, U. S.)
732. Thomas Sykes, Benjamin C. Sykes, Cleckheaton, and James W. Crossley, Brighouse, Yorkshire—Improvements in apparatus for heating water, air, or other fluids, generating and superheating steam, preventing incrustation in steam boilers, and consuming smoke.
733. Thomas Richardson, New Bridge Street, Newcastle-on-Tyne—Improvements in the manufacture of salts of alumina.
734. William Spence, Chancery Lane—Improvements in sewing machines.—(Communication from James Willcox, New York, U. S.)
735. William E. Newton, Chancery Lane—An improved preparation or solution for toning photographic pictures—(Communication from Joseph C. Rutherford and Benjamin H. Steele, Derby Line, Orleans, Vermont, U. S.)
736. William S. Macdonald, Manchester—Improvements in dyeing or printing woven fabrics of mixed materials.

737. Alfred V. Newton, Chancery Lane—An improved construction of bridle.—(Communication from E. Brechy, Colmar, France.)
738. John Blackwood, Banff, North Britain—Improvements in furnace or fire bars.
739. John D. Phillips, Ghent, Belgium—Improvements in steam engines.

Recorded March 22.

741. William Turner, Hockley, Nottingham—A new mode or method of making or manufacturing bread and other articles of paste, and in machinery or apparatus employed therein.
742. George Crawshaw, Gateshead Iron Works, Durham—Improvements in the manufacture of iron pulleys for winding from coal pits and other purposes.
743. George J. Calvert, York, and Charles L. Light, Parliament Street, Westminster—Improvements in portable buildings and structures.
744. John S. Bell, Newcastle-upon-Tyne—Improvements in steam engines and boilers.
745. John Granger, Handsworth, Staffordshire—An improvement or improvements in breech-loading fire-arms.
747. David Milliard, Liverpool—Improvements in sewing machines.—(Communication from James Rowe, Cincinnati, Ohio, U. S.)
748. George T. Peppe, Peak Hill, Sydenham, Kent—Improvements in the manufacture of thin sheet lead coated with tin.

Recorded March 23.

749. Henry Vigurs, Round Hills, Aston, near Birmingham, Warwickshire—Certain improvements in the treatment of paper or cardboard, such paper or cardboard being used for cards, wrappers, or boxes for exhibiting and holding small articles usually sold on cards or in boxes, also in the form of such boxes and wrappers, and the manner of attaching specimens of contents thereto.
750. Joseph P. Jennings and Frederick S. Stott, Bradford, Yorkshire—Improvements in singe plates.
751. John Taylor, Mark Taylor, and George Taylor, Denton, Lancashire—Improvements in the manufacture of hats, or of giving the final shape to the brims thereof.
752. Charles Prater, Charing Cross—Improvements in ammunition, bayonet, and sword belts, and in pouches to be worn therewith.
753. Isidor Hayem, jun., Rue Sainte Appoline, Paris—Certain improvements in making cravats and stocks—" magical cravats."
754. Richard Harrison, David Ashworth, and Joseph Lord, Burnley, Lancashire—A certain improvement in machinery or apparatus for preparing, spinning, and twisting cotton and other fibrous substances
755. Charles Ashworth, Fairfield, Lancashire—Certain improvements in power looms for weaving.
756. Joel Watts, Clifton Cottage, Sleaford Street, Battersea Park, Surrey—An improved safety valve.
757. Frederick C Meyer, Prune Street, Philadelphia, U. S.—Improvements in machinery for copying ornamental figures and forms.
758. William E. Newton, Chancery Lane—Certain improvements in looms for weaving.—(Communication from Silas C. Salisbury, New York, U. S.)
759. Benjamin Cooper, Frome, Somersetshire—Improvements in sizing and drying yarns preparatory to weaving.
760. William S. Lewis, Moseley Street, Manchester—Improvements in the manufacture of illuminating gas.—(Communication from Professor Sanders, Philadelphia, U. S.)
761. Samuel C. Lister, Manningham, Yorkshire—Improvements in carding and preparing machines.
763. George K. Snow, Watertown, Massachusetts, U. S.—Improvements having reference to bookbinding, and the folding and pasting of sheets of paper therefor.

Recorded March 24.

764. Henry V Physick, North Bank, Regent's Park—Improvements in electric telegrapha and apparatus connected therewith.
765. Herbert Haywood, Birmingham, Warwickshire—Improvements in machinery for the manufacture of buttons and other similar articles.
767. William E. Newton, Chancery Lane—Improvements in calendars for clocks or other timekeepers.—(Communication from Wait T. Huntington and Henry Platt, Ithaca, Tomkins county, New York, U. S.)
768. James Inglis, Glasgow—An improved artificial fuel.
769. Marc A. F. Mennons, Rue de l'Echiquier, Paris—An improved means of closing or filling metallic joints.—(Communication from Frederic P. Laugenard, Paris.)
771. Edward Abbott, Manchester Street, Manchester Square—An improvement in steering ships and other vessels.
773. John H. Johnson, Lincoln's Inn Fields, Buchanan Street, Glasgow—Improvements in the production of colours for dyeing or printing.—(Communication from L. et E. Boilley Freres, Paris.
774. James B. Corry, Queen Camel, Somersetshire—Improvements in the manufacture of gloves.

Recorded March 26.

777. James Ronald, Liverpool, Lancashire—Improvements in machinery for the spinning of hemp, flax, Manilla, or other like fibrous materials.
778. John A. Maxwell, Chancery Lane—Improvements in hydraulic engines, to act either alone or in combination with steam and steam engines.
779. Henry Gourlay, and Ebenezer Kemp, Dundee, Forfarshire—Improvements in steam engines and boilers.
780. Joseph Mitchell, Sheffield, Yorkshire—An improvement in pulleys applicable for raising and lowering window blinds, maps, and other articles, mounted upon rollers and retaining them in a given position.
781. Hilory N. Nissen, Mark Lane—Improvements in the preparation of paper in order to prevent the extraction or alteration of writings thereon without detection.
782. Henry Bowen, Spring Bank, Cardiff, Glamorganshire—An improved standard gas meter.
783. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in shaping metals and in the machinery or apparatus employed therein.—(Communication from Jean B. Vin, Rue Consulat, Marseilles, France.)
784. Jabez Church, Upper Kennington Lane, Vauxhall, Surrey—Improvements in the manufacture of coke.
785. Edward G. Renshaw, Little Nelson Street, City Road—A machine for cutting or producing from wood certain articles called machine lights or wood spills or lighters used for lighting pipes and candles, and other similar purposes.

Recorded March 27.

786. Alphonse R. le M. de Normandy, Odin Lodge, King's Road, Clapham Park, Surrey—Improvements in obtaining fresh water from salt water.
787. Charles Gillespie, Manchester—Improvements in bedsteads.—(Communication from Samuel Gillespie, New York, U. S.)
789. Edward Pohlman, Halifax, Yorkshire—Improvements in those musical instruments known as "German concertinas."
790. John R. Hunt, Chichester Place, Wandsworth Road, Surrey—Improvements in tobacco pipes.
791. Matthew Craufurd, Kinson Clay Pottery, near Poole, Dorsetshire—Improvements in blocks or bricks for building purposes.
792. Henry M. Clarke, Massachusetts, U S.—A new and useful or improved machine for the making and sizing of pulp used in the manufacture of paper.—(Communication from Thomas Eustice and Joseph Jordan, jun., Hartford, Connecticut, U. S.)
793. James Langstein, Charing Cross — Improvements in the manufacture of tobacco pipes.
794. David Millard, Liverpool — Improvements in sewing machines.—(Communication from W. E Braman, Cincinnati, Ohio, U. S.)
795. William E. Newton, Chancery Lane—An improved washing machine.—(Communication from George L. Witsil, Wilmington, Delaware, U. S.)

Recorded March 28.

796. John Weems, Johnstone, Renfrewshire—Improvements in steam boilers or heat and steam generators, and in the application of heat.
798. James L. Hancock, Pentonville Road—An improved apparatus for working and shaping butter, and for separating it from the butter milk.
799. Jean A. de Maniquet, Paris—Improvements in winding, doubling, twisting, and spinning silk, cotton, wool, flax, hemp, cord, and other filamentous materials.
801. Aene P. P. Dagron, Paris—An improved microscope to be used for exhibiting photographic views and productions.
802. James Leonard, Skinner's Place, Sise Lane—Improvements in apparatus used when weaving.—(Communication from Carl H. Zimmermann, Glauchon, Saxony.)
803. George F. Wilson, Belmont, Vauxhall, Surrey—Improvements in treating fatty and oily matters.
804. Robert H. Collyer, Beta House, Alpha Road, Regent's Park—Improvements in manufacturing pulp for paper, papier maché, and other similar uses and in apparatus employed therein, part of the invention being also applicable to other operations in which materials have to be subjected to the action of liquids, steam, and other fluids.
805. Stephen R. Smith, Hanover Terrace, Cumberland Road, Bristol—Improvements in vessels and apparatus used for raising sunken vessels and other bodies in the water, and for lowering materials for structural purposes in the water.

Recorded March 29.

806. Charles Stevens, Welbeck Street, Cavendish Square—Improvements in steel-yards and scales.—(Communication from P Danion, Brest, France.)
809. James Farmer, London—Improvements in the manufacture of cocoa and chocolate.
811. John Norris, jun., and Thomas Till, Birmingham, Warwickshire—Improvements in machinery to be used in the manufacture of wrought and horse nails.
813. John Monks, James Street, Bethnal Green—Improved machinery for manufacturing chenille.
816. Edward B. Sampson, Stroud, Gloucestershire—Improvements in condensing apparatus of carding engines.
817. John Hamilton, jun., Liverpool—Improvements in constructing and propelling vessels
819. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in chronometers.—(Communication from Louis F. C. Breguet, Paris.)

Recorded March 30.

821. William Richardson, Dudley, Worcestershire—Improvements in apparatus for the production of coal gas.
823. Paul A A. Beau, Porchester Terrace—A neomonoscope, or apparatus for viewing photographic and other like pictures.
825. Alfred Crosskill and James Gawan Crosskill, Beverley, Yorkshire—Improvements in reaping and mowing machines.

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 25th February, to 17th April, 1860.

February	25th,	4238	Peter B. Cow, 46 Cheapside, E.C.—"Carpet quoit."
	27th,	4239	James B. Rowe, Industrial Department, Schools of Compassion, Charles Street, Drury Lane, W.C.—"Improved school desk."
March	3rd,	4240	Charles Wheeler, Spenhamland, and John Hedges, Bucklersbury, E C.—"A furnace."
	7th,	4241	Eutichus Whittle, Wolverhampton—"Metallic joint"
	12th,	4242	Arthur Granger, 308 High Holborn, W.C.—"Safety envelope."
	14th,	4243	Birch and Mason, Birmingham.—"Sphere joint lever for beer engines."
	16th,	4244	John Tye, Agnes Street, York Road, S —"Sound opening for the violin, bass viol, or other description of violin."
	—	4245	William Bailey, Heneley Fields Chemical Works, Wolverhampton —"Lamp."
	17th,	4246	James William Lewis, Birmingham—"Joint for brooch-pin."
	19th,	4247	Charles Henry Chadburn, Liverpool—"Chadburn's set of distance-gauges"
	28th,	4248	Charles E. Hurst, Horsham, Sussex—"Muzzle protector."
April	5th,	4249	Joseph Mills, 40 Gt. Russell Street, Bloomsbury, W. C.—"An adjustable stove register."
	10th,	4250	George Neal, 104 Gt. Charles Street, Birmingham—"Neal's improved regulated silent Albert gas burner."
	17th,	4251	Holtzapffel and Co., Charing Cross, S.W.—"Rifleman's knife."
	17th,	4252	Joseph Bernays, Mayence, Germany—"The cover and stopper of a tobacco pipe."

TO READERS AND CORRESPONDENTS.

Fine Iron Castings.—An old correspondent writes as follows:—I have some pieces of cast-iron work as ornaments, commonly known as *fine Berlin castings*, and have had it by me for some years. It is now got a little faded; inclines towards rust. Can any of your numerous readers and correspondents inform me how I shall remedy the defects? Can they tell me the process adopted at Berlin, or in England, for *coating the fine cast-iron work*, and the peculiar varnish used by the Germans for the protection of their fine Berlin castings? I am very anxious about it, as the castings are of a beautiful kind.

Incrustations in Domestic Range Boilers.—An old correspondent asks us if we can furnish him with satisfactory information, as to preventing the formation of incrustations in kitchen range boilers. Can any of our readers help us?

M D. Rochdale.—Hogg's Treatise on the Microscope is a cheap and good work for a beginner: price 7s. 6d Dr. Carpenter's work is, however, much superior in point of extent of information; the price is 12s. 6d. Dr Quekett's book also stands A 1: published at 21s. Each has its peculiar excellence, and you will find in all of them carefully written descriptions of the polarizing apparatus.

PROPOSED IMPROVEMENTS IN THE AMERICAN PATENT LAWS.

By H. Howson.

By the third section of an Act approved August 19th, 1842, "in addition to an Act to promote the Progress of Science and the Useful Arts, and to repeal all acts and parts of acts heretofore made for that purpose," a new class of objects, for which no protection had been previously afforded by legislative enactments, was made the subject of letters patent, the duration of which is for seven years; the fees being fifteen dollars. These patents are for new and original designs applied to any manufacture, whether of metal or other material, the Act taking no cognizance of any peculiar advantages or utility which the object may possess, or of any process or art by which the form or ornamentation of the object is produced. The ornamental articles of manufacture which would form appropriate subjects for this class of patents, are so numerous that it would be a difficult matter to classify them, and yet how few manufacturers of such articles avail themselves of a law which was evidently enacted for their especial benefit! How few instances of new ornamental fabrics, new styles of jewellery, or other objects, the merits of which depend, for the most part, on their ornamentation and pattern, are to be found in the list of patents for designs! It cannot be supposed that the manufacturers of such articles have no desire to maintain a brief monopoly of their productions and a protection against copies and imitations of their wares by rival manufacturers. How is it, then that they so seldom avail themselves of the protection which the Act of 1842 is presumed to afford? The cause of this cannot be attributed to any indifference or neglect on the part of the manufacturers, but to some radical defect in the law. A lengthened experience as a Patent attorney has convinced the writer that such is the case; and that the defects are a source of general complaint, and that the law is generally unpopular. The Act has been declared to be ambiguous by more than one good legal authority, and its ambiguity has been frequently admitted by the authorities of the Patent Office. The defects of the Act regulating the grant of letters patent for designs may be classed under two general heads. First, the duration of the patent and the amount of fees are the same for every ornamental article of manufacture, and this, it is believed, is the main imperfection of the law. Secondly. The law affords a very doubtful protection against infringers on a patented design. It is proposed to devote the present paper to the discussion of the defects arising from the uniformity in the charges for, and the duration of the time of, patents for designs, and to suggestions as to the most appropriate remedies, leaving the inquiries as to the insecurity of this class of patents for a future communication.

It is contended that for some ornamental articles, a patent of seven years' duration is too short, and for other articles too long. In order to demonstrate this clearly, it will be necessary to discuss the subject in reference to two objects of a very different nature. A design for an ornamental stove and a fabric of a new and ornamental pattern, will be appropriate selections for this purpose. Under the present law, the patent will endure for seven years and the fee will be fifteen dollars in both cases. Now, in getting up a new design for a stove, the manufacturer must, in the first place, be possessed of a well cultivated taste, a readiness for producing figures and ornaments of pleasing effect. In the second place, he must be in possession of the requisite capital to meet the expenses. In preparing a new design for a stove, it is necessary to make three or four sizes; the patterns for these cost, one, two, or even three thousand dollars, according to the nature and extent of the ornamentation. Is there any just reason why a new and original ornamental manufacture which requires such an outlay as this, which demands no small amount of taste and artistic skill, should be protected by a patent of only seven years' duration, while trifling mechanical devices, many of them of doubtful merit, requiring but little outlay, and the exercise of very limited inventive faculties, are protected by a patent of fourteen years' duration? It may be argued that in one case the object relates to ornaments of no intrinsic value; whereas the object in the other case is for the accomplishment of some useful end, and that one object is, therefore, a more appropriate subject for legislative protection than the other. This would be a very contracted view of the matter. It is true that the production of an original ornamental design and the invention of a new machine, art, composition of matter, require different mental capacities, but both are of equal value to a civilised community. Ingenuity and art go hand in hand together; both have an equal demand on the fostering care of the government; as much, and perhaps more, time and labour are expended in the production of ornamental articles of manufacture which are fit subjects for patents for designs, as in the construction of appliances which can be protected by the ordinary class of patents. Why then should the laws make an invidious distinction between the inventor and the artist? Why should the laws say to the designer of jewellery, "You can have a seven years' patent for your design for a bracelet," and to the inventor, "You can have a fourteen years' patent for your device which forms the fastening for the same bracelet." It is an anomalous law which restricts the duration of a patent for a design to seven years, because it is a superfluous ornament, and protects the fastening, on the ground that it is a mechanical device for securing the same superfluous ornament. There can be no just reason why the designer should not be allowed to protect his production for the same length of time as the inventor.

The framers of the Act of 1842 had, doubtless, no intention of legislating to the injury of the artist; they may have been actuated by every desire to encourage art in deciding upon the reduced terms for the duration of this class of patents and the reduced fees, thinking that it would meet the wishes and requirements of the designers themselves. They appear, however, to have lost sight of the fact that the law must have an unequal bearing on the producers of different ornamental articles.

To return to the manufacture of ornamental stoves. It has been already remarked that the preparation of the patterns is a most costly matter; so great is the original outlay that every stove manufacturer would be glad to secure his design for double the length of time at present allowed, by the payment of additional fees. It is well known that small manufacturers, men with neither taste, enterprise, nor capital, are in the habit of waiting for the expiration of a patent of a popular and elaborately carved stove, and after this expiration, of purchasing a stove, using the plates for patterns, and furnishing them to the public to the injury of the original producers. If a stove will retain its popularity for twelve or fourteen years, who should reap the benefit of that popularity? Surely not the piratical foundryman, who not only makes a *fac-simile* of the stove, but actually uses the plates for patterns; but the original designer or producer, the man who can command the necessary artistic talent, the capital to turn that talent to account, and the business tact and enterprise which enable him to furnish the public with a highly ornamental article of utility, at a comparatively small cost. An extended intercourse with stove manufacturers enables the writer to assert, that quite as many patents would be obtained for designs for stoves at a charge of thirty dollars government fee, as are now procured at a cost of fifteen dollars; provided the duration of the patent could be increased in proportion. If the duration of a patent for a design, however, be fixed at fourteen years and the fees at thirty dollars, the law, while it worked to the advantage of stove manufacturers, would bear injuriously and unjustly on manufacturers of other ornamental articles. The producer of the ornamental fabric would deem it a great hardship if he was compelled to pay thirty dollars for the protection of a design which would, most probably, be out of fashion in two or three years. For a class of ornamental articles, the sale of which depends on the caprices of fashion, the duration of the patent as at present fixed by law (seven years) is too long, and the fees (fifteen dollars) too large. It is, for the most part, the amount of fees demanded which has hitherto prevented manufacturers of an extensive class of ornamental goods from availing themselves of the protection which the present law affords. Could the manufacturer of the ornamental fabrics obtain a patent for three years by paying a government fee of five dollars, six dollars, or seven dollars, there can be no doubt that numbers would avail themselves of an opportunity which they had hitherto neglected on the ground of economy. It appears to the writer, that a very simple alteration of that part of the law which regulates the duration of time and the amount of fees for patents for designs would meet the exigencies of all manufacturers of ornamental articles. The proposed alteration is, to establish three classes of patents, as follows:

First class,	duration 14 years,	- - -	fee, 30.00 dols.
Second class,	,, 7 ,,	- - - -	,, 15.00 ,,
Third class,	,, 3½ ,,	- - - -	,, 8.00 ,,

Then will arise the question—"who shall have the power of classifying the different ornamental articles which form the application of patents for designs?" Not the authorities of the patent office, for this would be too arbitrary a measure, and one which would give rise to tedious and expensive correspondence between the applicants and the office, and would be a certain source of much dissatisfaction. Let the producers or applicants themselves select the class under which they desire the patent to be granted. This is a power which may be safely entrusted into their hands. The stove manufacturer will deem it to his interest to select the first class; the designer of a bust of some popular character, thinking that his production will retain its popularity for seven years, might select the second classs. The weaver, and wall-paper manufacturer, owing to the sudden changes in the fashion of their productions, would doubtless select a patent of the third class.

After the patent has been granted for the time selected by the applicant, he should be allowed no extension of this time; he should have no right to transfer his patent of the third class to that of the second or first class, by the payment of additional fees; should such a course be allowed, it would certainly give rise to much extra labour in the patent office, much confusion and constant litigation. If an applicant has selected for his production a three years' patent, and subsequently discovers that the design patented will retain its popularity for a longer period than he expected, no fault could be found with the law, as it afforded him an opportunity of selecting a longer term; the blame rests with himself, and his own want of foresight. The law, too, should compel the patentee to mark the article patented, not only with the date of the patent, but with the class under which it has been issued, so that the public may be aware of its true nature and extent.

Should such modifications be established, it would be but an act of justice to introduce a provision by which the holders of unexpired patents for designs granted under the old law, might, by the payment of the extra fees, have their patents extended to fourteen years from the date of the original grant.

Whenever any sweeping modification in the law regulating the grant of letters patent is contemplated, there are three points to be considered in connection with the proposed alterations:—1st, How will it affect the public? 2d, What effect will it have on the manufacturer? and 3d, Will it tend to increase or diminish the revenues of the Patent Office?

What effect will the alterations suggested above, have as regards the interests of the general public?

A manufacturer of ornamental articles, whose productions can be protected at a trifling cost, will have some inducement for calling into play superior skill, and a higher class of art, knowing that the monopoly will prove an ample re-payment for the outlay and exertion; the rival manufacturer will endeavour to outstrip his neighbour in producing articles of a superior and more attractive design. Thus would the demand for labour be increased, the cultivation of the higher branches of art be stimulated, and the restless demands of the public for constant changes in all ornamental articles be satisfied. It will be needless to remark, that the manufacturers and producers must be benefited by the above alterations; the benefit being especially felt by the manufacturers of stoves and other metal ornaments;—small manufacturers of this class of articles will, no doubt, continue to use as patterns the castings from the original design, even after the expiration of a patent of fourteen years. But the alteration will, at least, allow the original designer to effect sales sufficient to repay him for the outlay before the piratical foundryman can deprive him of his monopoly.

What effect will the proposed alterations have on the revenues of the Patent Office?

As many, or perhaps, more patents for designs for stoves would be granted under fees of thirty dollars, as have hitherto been issued under fees of fifteen dollars, so that the revenue arising from this class of ornamental articles would be at least doubled, without the demand of any extra labour on the part of the Patent Office clerks. Then the alterations would open a channel for a further revenue arising from patents of the second and third class.

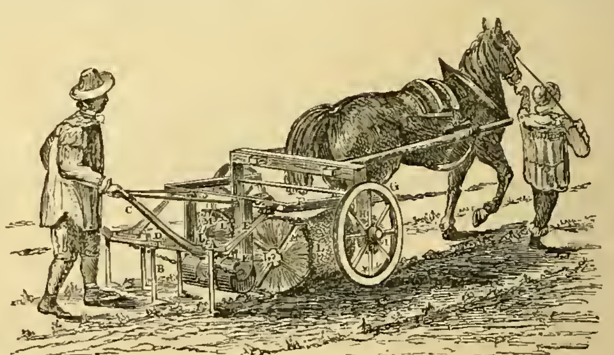
It is impossible to estimate the probable number of applications of the third class of patents, but it is very certain that as soon as the producers became aware of the facilities which the law afforded for protecting their productions at a trifling cost, the number of applications would be very large, and the revenue proportionately increased.

It is true that an extra number of clerks might be necessary to attend to this influx of patents of the third class, but the salaries of these additional clerks would be but a fraction of the revenue derived from the additional fees resulting from the alterations suggested above.

MAJOR MUNN'S HOEING AND THINNING IMPLEMENT.

One of the most destructive pests which the turnip grower has to contend with, is the caterpillar, popularly known as the "nigger," which attacks the young plants and commits fearful ravages on the foliage. The implement which we have shown in the subjoined figure, as well as being designed for hoeing all kinds of corn and root crops, is also specially adapted for sweeping off catepillars and other insects which infest the crops, and crushing them beneath the rollers of the machine. By means of a series of knives, to which a rotatory movement is imparted, the implement is thereby adapted for thinning out young crops of turnips or mangel wurzel.

We illustrate this invention by a perspective engraving, showing a general view of the whole machine as at work in a turnip field. A, is a frame, to which are attached the hoes, B; C, are the guide handles; D, bars to which the hoes, B, are attached, by couplings, or clamps, and screws, in the usual way; E, are rods, or bars, which connect the frame, A, with the frame, F, which carries the thinning and cleaning apparatus.



There are holes, or eyes, in the ends of the rods, E, which hook on to the hooks fixed to the frame, F. There are two driving wheels, G, which are connected to a main axle, working in bearings in the frame, F. A spur wheel, H, is fixed to the axle of the driving wheels, and works into and turns the pinion, I. The axle shaft of this pinion is supported by bearings also attached to the main frame, F. Rather lower and in front of the main axle on this shaft, are two bevel wheels, each gearing into bevel wheels on the front end of the two shafts, J. The driving wheel next to the spur wheel, H, is fixed to the main axle; the other driving wheel runs loose upon it. The bevel wheels revolve with their spindles, and cause the bevel wheels, to which they are geared, to revolve in opposite directions; the bevel wheels are attached to spindles, J, which work in bearings fixed to a cross bar of the frame, F. At the opposite ends of the spindles, J, there are universal joints which communicate motion to the spindles, J; the other ends of these spindles work in, and are supported by bearings on a bar, K. Wooden cylinders are fixed on the spindles, and to these are attached the brushes, L, made of bass and cocoa fibre, or other similar material; or, instead of brushes, flaps of leather, or cloth, may be used. On the spindles, J, are also fixed short cylinders, to which the knives, M, are fixed by screws, which hold them in sockets in the cylinders. The number of knives will depend on the extent to which it is desired to thin the plants. The more knives used, the more the plants will be thinned. In the engraving, four sockets and knives are shown in each cylinder; but the cylinders may be made with sockets for six or eight knives. Two bars are fixed to the back of the frame, F, with bearings at their lower ends, for the axle of the rollers, X, to work in. On these bars others are fixed parallel, forming slots for the bar, K, to work in. Cords, or chains, are attached to each end of the bar, K, and passing up through small rollers, or pulleys fixed to the frame, F, are fastened to the levers on the guide handles, C. These levers can be depressed by means of handles within convenient reach of the driver.

On the machine being drawn forward, motion is communicated by one of the driving wheels to the pinion, I. The bevel wheels are, by these means, set in motion, and they cause the spindles, together with the brushes or flappers, and knives, to revolve. The length of the brushes or flappers must be such that they just sweep over the rows of turnips, or other plants, and brush or flap off the insects upon them towards the centre of the machine, so that they may fall between the rows of turnips, or other plants. By the rotation of the spindle, J, the knives also rotate and cut into the rows of turnips, or other plants, at intervals, so as to thin them, and the insects, being brushed or flapped from the plants, and cast upon the fallow ground between the rows, are crushed by the rollers, X, which follow. The hoes which follow the rollers hoe the ground in the usual way, and are useful also in burying the insects. When it is desired to arrest the thinning and brushing, or flapping, of one or both of the rows of plants, the person guiding the hoe by the guide handles, C, pulls one of the two hand levers which are attached to the handles, C. These levers depress the cords or chains which are attached to the bar, K, which carries the spindles, J, of the brushes and knives. By these means, one or both ends of the bar, K, are raised, and the hinder ends of the spindle, J, are thereby also raised. The axle of the pinion, I, is squared outside the frame, F, and the pinion slides upon the squared part, so that it can be thrown out of gear with the spur wheel; a screw retains it in its place, either in or out of gear, as required. When it is desired to stop the hoeing, thinning, and brushing for a short time, as in turning, the person guiding the hoe raises the guide handles, at the same time depressing a lever attached to the main handles. The hoes are thus lifted out of the ground, the knives and brushes raised clear of the plants, and the rollers also lifted up by loose chains connected to the frame, E.

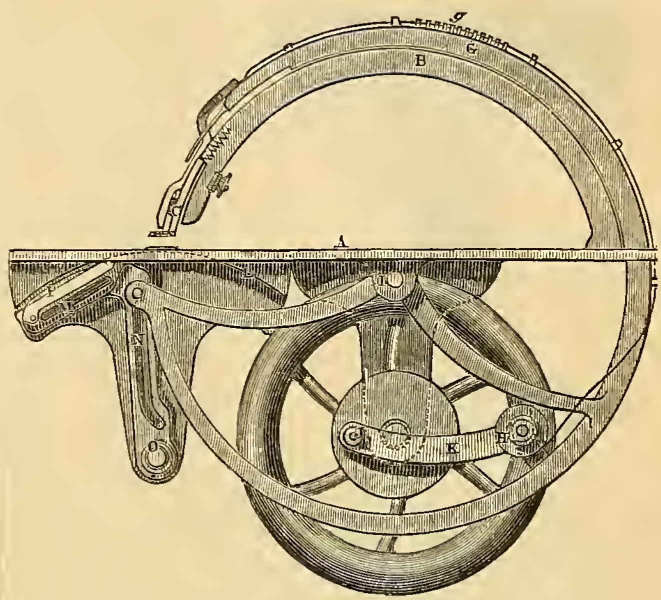
If it be desired to clean the plants without thinning them, the knives can be removed from their sockets in the small cylinders by taking out the pins of the universal joints, the spindles, J, with the knives and brushes, can be entirely removed. This may be desirable when it is wished only to hoe the plants, or to adjust or repair the brushes or flappers. This implement is one that, from the varied purposes to which it can be applied, and high practical utility, should command an extended patronage among agriculturists.

HISTORY OF THE SEWING MACHINE.

ARTICLE XXVII.

G. T. Bousfield obtained a patent for improvements in sewing machines, communicated to him from abroad, dated the 16th of January, 1857. The leading features of this invention are a peculiar feed, a mode of applying tension to the needle thread, a curved or segmental balanced needle bar or lever, a peculiar shuttle driver and mode of driving the shuttle. Fig. 178 represents a side elevation of the machine, showing the mechanism beneath the plate or table. A, is the table of the machine, to the rear end of which is firmly screwed the semi-circular bar or bracket, B, the front end of which reaches nearly to the surface of the plate, and is provided with a holder or foot, C, and adjustable either higher or lower, according to the different thicknesses of the material placed beneath it, by means of slots, and secured at any height by a thumb screw. A perspective view of this holder with the feed mechanism detached, is given at fig. 179. A lever, D, is pivoted to this holder, and its lower end extends through a suitable opening formed in the sliding feed bar, E, a detached view of which is shown at fig. 180, and thereby imparts a to and fro sliding motion to the slide which works in a dove-tailed groove in the foot of the holder, as shown. That part of the feed bar, E, which constantly rests upon the material and feeds it along is provided with a curved claw, inclined towards the needle; so that when it is moved backwards it passes freely over the cloth without moving it, but when moved forwards, or towards the needle, the claw catches the cloth and carries it along with it a distance corresponding to the length of stitch to be produced. This traverse is regulated by the set screw, F, in the lever, D, which is actuated alternately to and fro by a pin or cam and incline plane on the needle bar, G, the feed being thus obtained solely from the vibratory motion of the needle bar. In the downward stroke of the needle bar, and while the needle is through the cloth, the incline strikes against the set screw, F, thereby causing the feed bar or slide to be moved back the distance required for the length of stitch, and in the upward motion of the needle bar, the cam or pin operates upon an incline formed on the upper end of the lever, D, and thereby carries the feed bar forward towards the needle, and with it the cloth for the next stitch.

Fig. 178.



The needle bar works over the surface of the curved bar or bracket, B, which serves to steady it, and is provided with a series of pins, G, through any desired number of which the needle thread is laced, according to the degree of tension required. The bobbin, H, which supplies the thread, is carried by the lower portion of the needle bar, which is extended below the table in a circular direction, as shown, and vibrates on a fixed centre at I, coinciding with the centre of the curve of the needle bar, thus effectually balancing the same during its motion which it derives from the crank pin, J, and link, K. The shuttle race, L, extends from the lower side of the table, A; it consists of a curved projection near to or against which the top face of the shuttle, M, is held by its driver, N. This driver vibrates to and fro on a fixed centre, O, in a bracket extending below the underside of the table of the machine. Fig. 181 represents a side view of the shuttle race with a portion of the table in section, and showing the shuttle driver attached. This driver is actuated by a pin in the lower end of the circular needle bar, which pin works in a slot in the shank of the driver. When the driver is at its extreme backward position, as shown in fig. 181, the needle is through the cloth, and the pin in the needle bar has passed from the straight part of the slot and entered the curved portion near the lower end of the driver. When the needle has risen sufficiently to form a loop or bow in the thread for the point of the shuttle to enter, the driver has moved forward so as to bring the point of the shuttle between the needle and its thread, and then, whilst the needle is rising to the surface of the table, the driver, by means of the pin in the needle bar passing from the curved to the straight part of the slot, carries the shuttle through the loop, when its speed gradually decreases until it stops simultaneously with the needle, the stitch being thus drawn into the cloth by the tightening of the two threads at the same time. On the head of the shuttle driver is placed a spring, P, carrying a pin for holding the shuttle in its place on the driver, and carrying it to and fro therewith. This pin passes through the side of the driver and enters a corresponding hole in the front end of the shuttle, a separate detail of which is given at fig. 182. This pin is withdrawn momentarily by the action of a fixed stop upon the spring, P, to allow of the passage of the needle thread loop over the shuttle, when it is again replaced by the pressure of the spring. A loop guide lever is pivoted to the feed motion lever, D, and to the lower end of this guide lever are secured two curved springs, between which the needle thread during the completion of the stitch, is drawn. A cam on the needle bar operates upon the upper end of the guide lever, so

Fig. 179.

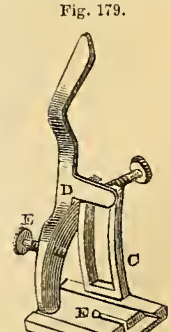
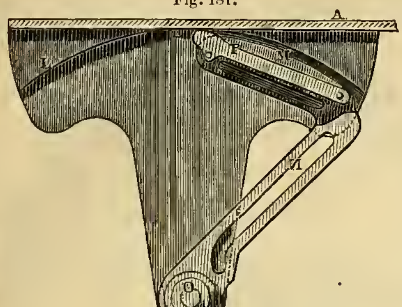


Fig. 180.

as to throw the springs forward to receive the thread between them, which springs are then returned to their original position, with the loose thread formed by the descent of the needle, nipped between them. By this arrangement, the loose loop of the needle thread is always guided in one direction, by the thread being drawn between the springs during the time the stitch is being completed, and drawn from between the springs by the downward motion of the needle in the succeeding stitch.

Fig. 181.



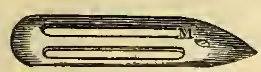


Fig. 182.

William Edward Newton obtained a patent on the 20th of January, 1857, for an invention communicated by a foreign correspondent, in the specification of which a universal feed motion is described for feeding the cloth in any or every direction, and enabling the direction of movement to be changed as may be found requisite. The cloth is confined and moved between the face of a rotatory disc or plate, through and in a line with, or nearly in a line with whose axis the needle or needles work, and the periphery of a roller, the axis of which is nearly or quite perpendicular to the axis of the disc or plate and radial thereto, the roller being moveable round the needle so as to bear upon the material on any side of the needle. On communicating motion either to the disc or to the roller, the cloth will be moved forward between them in a direction parallel to the plane in which any portion of the roller rotates; the roller, when not having the motion imparted to it directly, in the first place, receiving rotatory motion from the disc through the friction of the material. This feed motion is applicable to the needle and shuttle machine, or to two needle machines and single thread machines, when a needle and looper are employed. The second part of this invention is applicable only to shuttle machines, and consists in providing for any slight variation of the direction of the motion of the shuttle that may be necessary to bring the shuttle in proper relation to the needle, by fitting the shuttle with grooves to run upon two parallel ways or guides, adjustable laterally on a box or block, which is itself adjustable in a direction perpendicular to the adjustment of the ways or guides. The machine, illustrated by the drawings annexed to the specification, appears to be of a very complicated and expensive nature

In the specification of a patent granted to John Henry Johnson, on the 26th of January, 1857, for an invention communicated to him by Mr. J. E. A. Gibbs, of the United States, a single thread machine, of a peculiar construction, is described; the needle, working in combination with a stationary hook for forming a chain stitch, by which arrangement the whole of the mechanism hitherto required for actuating the hook, is entirely dispensed with. The feed or traversing motion of the cloth is obtained from a hook attached to the head of the needle carrier, which carrier consists of a laterally vibrating arm in place of a slide. A peculiar clamp is also employed for holding the cloth securely down upon the cloth table during the whole operation of forming and tightening the loop, and releasing it from pressure at the moment the feeding of the fabric is to be performed. An appliance is adpated to the machine for guiding the needle properly at the moment of entering the cloth.

Mr. Robert Macdonald obtained provisional protection only for improvements in sewing or embroidering textile fabrics, on the 14th of March, 1857; which improvements are more particularly applicable to the production of what are commercially known as "sewed muslins." The invention here consists of an improved mode of hand sewing, wherein the figure is worked on the fabric by coiling the thread upon the point or end of the needle protruding through the fabric, and then withdrawing the needle so as to leave the coils of thread retained in a solid and raised mass upon the fabric. A beautiful effect is said to be obtained by adopting this stitch, and the pattern receives a considerable relief. We must apologize for introducing this invention into a *History of the Sewing Machine*, but our excuse is, that the stitch seems so simple and capable of being so easily tried by any one, we thought some of our readers might be sufficiently interested in it to make the experiment for themselves in working patterns in fabrics.

A. E. L. Bellford obtained a patent on the 25th of March, 1857, for improvements in sewing machines, communicated to him from abroad, which improvements have reference to a former patent granted to Mr. Bellford on the 13th of December, 1854, (noticed in article xxi.,) and to another patent granted to the same gentleman on the 1st of November, 1855. (See articles xxv. and xxi.) In the specification of the first of these patents a mode is described of passing the loop of the needle thread over a thread case, by means of a lateral motion of the needle, or by a motion of the point of the thread case, and in the specification of the second patent above referred to, a mode is described of passing the loop of the thread over a looper by the motion of the needle on its axis. Now according to the present invention the needle is neither turned on its axis nor moved laterally, but has merely the usual up-and-down motion imparted to it. Fig. 183 represents a side elevation of this machine; and fig. 184 is a front view of the same. The needle slide, A, is actuated by a crank and connecting rod; from the driving shaft, B, the needle has an eye near its point, from one side of which runs a spiral or diagonal groove, wherein one half of the loop lies during the descent of

Fig. 183.

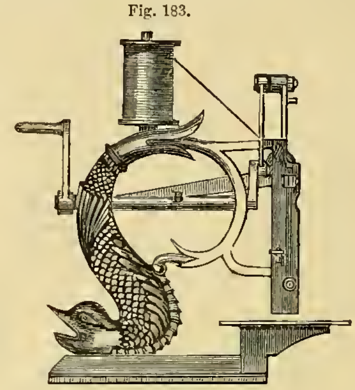
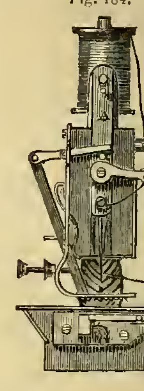


Fig. 184.



the needle. As the needle rises, this portion of the loop becomes bowed or slackened out, and is caught by the point of the stationary looper, C, which is held against or in close proximity to the needle. The upper end of this looper is rounded, and bears against the under side of the table or bed-plate of the machine; and when the loop has slipped up the shank of the looper to this point, it is held during the feed motion of the cloth, and until the needle has again descended, which it does through the cloth and through the loop thus retained, whereupon the loop is released by being drawn over the rounded top of the shank of the looper and tightened to form a stitch, the succeeding loop being similarly caught by the point of the looper, and retained as before till the next descent of the needle, thus producing the chain or tambour stitch. By making the shank of the looper, however, sufficiently large, to contain a spool, it is obvious that a lock stitch of two threads may be produced. As these are the main features of the invention, we will pass over the rest of the machine, not omitting, however, to draw attention to one very striking feature of novelty, not essential, it is true, to the working of the machine, nor claimed by the specification; we refer to the admirable design of a dolphin for the main standard, standing on its head and producing a most painful feeling in the mind of the beholder, by having a spindle remorselessly thrust through its body. We can at least congratulate the designer on the undoubted *originality* of the conception, if we cannot felicitate him on the aptness of the idea.

Messrs. George Pearson and Edward Jessop obtained a patent on the 7th of April, 1857, for certain improvements which bear a very strong resemblance to the Grover and Baker arrangement of circular needle, the only difference being that in place of having a circular needle on a *vertical* axis, they use a circular needle of a spiral form, working on a *horizontal* axis, the point of the needle worming its way through the loop of the needle thread, and so introducing the second thread therein in a looped form, through which loop the vertical needle again descends, and so on. The stitch thus produced will be identical so far as we can discover, with the Grover and Baker stitch.

A patent was granted to Thomas and Frederick Sugden on the 16th of April, 1857, for their invention, the main points of which are an improved feed, a mode of giving a lateral or forward and backward motion to the vertical needle in ordinary circular needle machines, and the application of an improved form of under needle to other sewing machines, wherein a second needle may be used. The machine in question is for producing the double chain stitch, and in lieu of a straight or circular under needle, the patentees propose to employ for carrying the under or second thread, an L shaped needle or instrument which oscillates to and fro on a centre. This needle consists of two parts, one resembling the other, with the exception of the eye, which is only in one of the parts. This instrument is carried by a rocking shaft, and the part in which the eye is formed is fixed or stationary, whilst the other fits thereto and is oscillated to and fro so as to slide against it, alternately closing and opening, or separating the two parts. The nose of this instrument carrying the second thread enters the loop of the needle thread, the sliding half then recedes and opens that loop and also the loop of the second thread, and carries the second thread round the vertical needle, which as it moves downwards forms the stitch. The improved feed motion consists of a beam or lever vibrating on a pin, and placed under the table or bed-plate of the machine; one end of this lever is actuated by a cam on the driving shaft, whilst the other end is connected to the feeding plate. A spring is used for opening and placing the needle loop in position, for the entrance therein of the under needle with greater certainty. The patentees further propose in circular needle machines to impart a lateral or forward and backward motion to the vertical needle, by fitting its carrier in a slide, which slide has a horizontal movement imparted to it by a lever and cam.

A patent was granted to John Henry Johnson, on the 22d of April, 1857, for improvements communicated to him from abroad; but the specification, which is accompanied by four sheets of drawings, is too long and intricate to enter into the details of the various parts of the invention. We therefore content ourselves with a general outline of the several claims, and refer our readers to the document itself for further enlightenment. The claims are limited to the peculiar description and drawings given in the specification, and comprise—*Firstly*, The driving a spool case, or discoidal shuttle, at an angle with the driver, such driver consisting of a circular plate or disc fitted with teeth at right angles to its face, and gearing into corresponding recesses or notches in the back of the shuttle; *secondly*, The drawing or tightening the loop of the needle thread in an opposite direction to the movement of the needle, so as to complete the stitch when the needle is at its lowest position, by the aid of a stationary and moveable eye piece or guide; *thirdly*, The use of a stud pin, having a crank motion for actuating a discoidal shuttle; *fourthly*, A peculiar mode of driving a discoidal shuttle, by means of segmental racks gearing into corresponding notches in the shuttle itself, in such a manner as not to interfere with the passage of the loop of the needle thread over the shuttle; *fifthly*, The placing a circular or discoidal shuttle in such a position that its point will enter the needle loop in a direction parallel to the motion of the cloth; *sixthly*, Placing the axis of a discoidal shuttle or rotatory hook at an angle with the line of motion of the needle; *seventhly*, The use of a peculiar friction spring inside the central spool of a discoidal shuttle, for the purpose of giving tension to the shuttle thread—such spool having no transverse motion; *eighthly*, Placing or forming the eye of the vertical needle parallel to the motion of the shuttle point entering the loop, and employing a contrivance for bending the loop sideways within the reach of the entering point of the shuttle; *ninthly*, A peculiar combination of yielding presser foot, for pressing the cloth on to the roughened plate of the feed motion, with a circular or discoidal shuttle; *tenthly*, The drawing up of the slack loop formed by one point of a double pointed discoidal shuttle, by the simultaneous extension of the succeeding loop, effected by the second point of the same shuttle; *eleventhly*, A peculiar mode of holding the loop of the shuttle thread, so that it may be slackened in proportion as the succeeding loop is tightened, by means of a double pointed circular or discoidal shuttle; *twelfthly*, The so arranging double pointed discoidal shuttles as to take up the loop on one side and throw it off on the other; and *lastly*, The use in discoidal shuttles of two points or hooks, making only one half a revolution for each stitch.

PREPARATION OF SKINS.

M. Alcan, of Paris, has within the last few years brought out an improved system or mode of treating skins of the finer and softer descriptions, used in glove-making, such as kid, goat, and lamb skins, which require great softness, elasticity, pliability, and whiteness. In carrying out this process the skins are first nourished, then tawed, and finally dyed. The nutriment employed consists of wheaten flour of the best quality, the yolks of fresh eggs, alum and marine salt, the salt is dissolved in lukewarm water, to which is added the yolks of eggs, and flour, which is to be well worked together, until the whole assumes a syropy consistency. Into this mixture the skins are steeped, and changed or stirred from time to time for the space of about one hour. Without this nourishment the skins would be nothing more than a species of gelatine of no value, and totally unfit for the various uses to which they are intended to be applied, but by the mode of treatment above described they are rendered soft and supple.

With a view to remedying the defects of inequality of thickness, flexibility, and colour, and to impart a more general uniformity to the skins, whereby they are better adapted to receive the dye evenly, they are cleansed or purged in the following manner:—The skins to be treated are placed in a tub or trough of hot water, and are then well trodden and worked by the feet of the workmen, which operation equalizes the skins, removes the fatty and other matters with which they may be charged, removes to a great extent the nourishment of the previous operation. To render the skins supple again they should be again nourished, the nutriment being composed sometimes of a mixture of eggs and flour, but more frequently the addition solely of eight or ten yolks to the dozen of skins is enough, they are again worked or kneaded with the yolks of eggs mixed with hot water, so as to thoroughly impregnate them, when they will be found in a fit state for dyeing. As the yolks of eggs are found to be inconveniently costly at times, M. Alcan has endeavoured to discover some other substance of similar softening properties, and at a more reasonable cost, and has fixed upon the brains of animals, which, from their chemical composition, and more particularly from the presence therein of fatty acids, render them especially applicable to the purpose in question. The brains are dissolved in hot water, thereby producing a fatty and penetrating liquid, but of course, in order to free such liquid from particles of flesh, bone, and other foreign bodies, it is necessary to strain it through sieves or cloth strainers. When used this liquid may be employed either pure or mixed with flour, to constitute a paste, as in the application of eggs, and when used as nourishment before dyeing and after the cleansing and purging process, pure brains dissolved in water may be employed.

In order to determine the proportions of brains in each case, such proportions varying according to circumstances, the following method may be adopted. The degree of acidity of the yolk of eggs being known and tested by the red colour imparted to litmus paper dipped into it, it is simply requisite to dip this test paper into a solution of brains, which solution will be of the proper strength when the same amount of discoloration is imparted to it as to that dipped in the yolk of eggs. The proportions once established, and the weight of brains requisite for a given result, its application becomes as simple as that of the yolk of eggs.

It has been found that the solution of brains is of such an active nature, that it may be advantageously employed for improving waste skins which are not sufficiently elastic. By cleansing and nourishing them by this solution, and introduced into the pores of the skins by the aid of a force pump or other pressure, they may be rendered sufficiently elastic to be employed in the manufacture of gloves. The inventor has found that an excellent result may be obtained by mixing the brains with fatty acids, so as to form a species of pasty emulsion, in the preparation of which it is simply necessary to add gradually the fatty acid in the required proportions to the brains, the resulting mixture having neither oily properties nor those characteristic of brains, but will participate equally of both. This admixture may generally be made by hand, but mechanical agitators or stirrers may also be advantageously employed. The new composition offers many advantages over the pure brains, for example, it is richer in those matters which directly influence the softness of the skins; it is more economical; there is no liability to its becoming fermented or giving out fetid odours; the combination of brains for example with oleic acid may be preserved in a sound condition for an indefinite length of time, and may therefore be extensively used in the preparation of skins.

ON THE PRODUCTION OF COLOURED PHOTOGRAPHIC PROOFS, BY M. NIEPCE DE SAINT VICTOR.

An interesting communication has been recently made to the Académie des Sciences, by M. Niepce de Saint Victor, on the production of different coloured photographic proofs. To obtain a red proof, the author prepares the paper by steeping it for about 15 or 20 seconds in a solution of nitrate of uranium, containing about 20 parts of nitrate to 100 of water, and then drying it in the dark. This paper may be prepared several days before using it. Its exposure in the frame varies in duration according to the intensity of the light, from 8 or 10 minutes in sunshine, to 1 hour in the shade.

On its removal from the frame the proof is to be washed for a few seconds in warm water at a temperature of from 120° to 140° Fahr., after which it should be plunged into a solution of red prussiate of potash, containing 2 parts of prussiate to 100 of water. After a few minutes, the proof will acquire a beautiful blood red colour, when it should be washed in several waters until the liquid flows off perfectly colourless, and then dried.

To obtain a green proof, a red one obtained in the manner above described should be steeped in a solution of nitrate of cobalt for about one minute, it is withdrawn without washing, and the green tint will appear on drying it before the fire. It is fixed by subsequently placing it for a few seconds in a solution of sulphate of iron and sulphuric acid, consisting of 4 parts of each to 100 parts of water, it is then passed through water once and dried at the fire.

To obtain a violet proof with the paper prepared by the uranium process above described, the proof on being removed from the frame should be washed in hot water, and developed by a solution of 1 part of chloride of gold to 200 parts of water. When the impression has attained a good violet colour, it is washed in several waters and then dried.

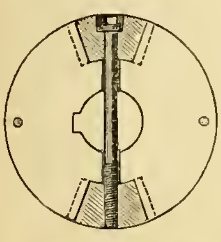
For producing a blue proof, the paper is prepared by steeping it in a solution of red prussiate of potash, of a strength of about 20 parts of prussiate to 100 of water, after which it is dried in the dark. This preparation may be made several days before using it.

The proof should be removed from the frame when the isolated parts have acquired a light blue tint, and placed for the period of from 5 to 10 seconds in a solution of bichloride of mercury saturated cold. It is washed once in water, and then a hot solution of oxalic acid, at a temperature of from 120° to 140° Fahr.; but saturated in the cold state, is to be poured over the proof, which is subsequently washed two or three times and allowed to dry.

COUPLING BOX WITH MOVEABLE TEETH.

Mons. Blondell, a well known French engineer, has lately invented an ingenious and simple coupling box with moveable teeth, of which the annexed cuts represent respectively a transverse section through the teeth and centre of the coupling, and a side elevation. The chief advantages derived from this box, are its exemption from derangement and consequent repairs, whilst the unmounting of shafts whether in a vertical or oblique position, or used as horizontal crank shafts, is greatly facilitated, without the necessity for knocking out keys or otherwise deranging the coupling box, which is made to open in two parts, and so permit of the easy withdrawal of the shaft. Another important feature of this improved coupling is the total absence of projecting objects thereon, such as bolts, keys, &c., which are so liable to entangle driving straps and catch the clothes of the attendants.

Fig. 1.



This apparatus consists of two boxes, in which are cut two converging dove-tailed slots or recesses, for the reception of two double-dovetailed and tapered blocks, one half of which is engaged in the upper box, and the other half in the lower box. These two blocks or teeth are situated diametrically opposite to each other, and are connected by the screw, the head of which is countersunk into one of the blocks or teeth, and the opposite end is screwed into the opposite block, which thus serves the purpose of a nut. The two boxes are bored out centrally to admit of the introduction of the ends of the shafts therein, and a key slot is also provided, as shown, for the reception of a key for securing them to the contiguous end of the two shafts to be coupled.

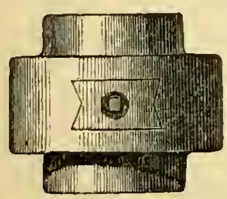


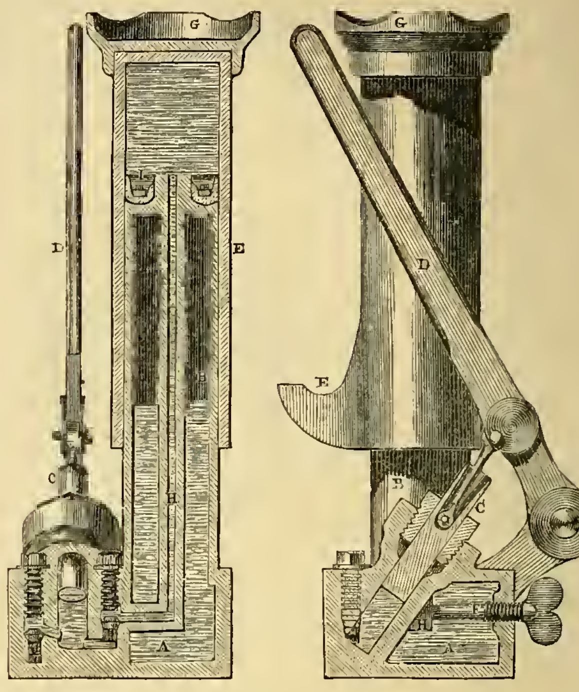
Fig. 2.

These keys are slightly tapered from the interior to the exterior, so that when the two boxes are forcibly held together by the action of the blocks, tightened up by the screw, the interior heads of the two keys will be brought in contact with each other, and consequently all chance of their shaking loose and dropping out is obviated. Where great strains have to be borne, the two boxes may be further coupled by means of two additional bolts. The tapered form of the slots or recesses, shown in fig. 1, admit of the boxes being further tightened up should any looseness occur after long service.

HYDROSTATIC LIFTING JACK.

A highly useful arrangement of the lifting jack has been brought out by Messrs. Robertson and Tweedale, of Johnstone, engineers and machinists. This modification of the jack is arranged upon the hydrostatic principle; it is exceedingly compact and powerful. The improvements introduced in its construction are such as will greatly extend its utility as a handy mechanical appliance in the shop of the engineer or builder.

The jack consists of a rectangular base, A, by preference made of cast-iron and hollow, so as to form a holder or reservoir for the water or other actuating fluid. Springing from the base and forming part of it, is a vertical cylinder, B, closed at the upper end, but having a central open tube cast in one with the cylinder and base, or these several parts may be screwed or otherwise fitted together. The central tube descends into the chamber or reservoir in the base, where it branches off at a right angle, and enters a transverse passage which communicates with the chamber of the force pump, C, the passage of the water or other liquid to the central tube, H, being controlled by an outlet valve which prevents the return of the liquid to the reservoir. The chamber of the force pump has another tubular passage which forms the communication between it and the reservoir in the base, this inlet passage is shut by means of a valve, which prevents the return of the liquid in that direction. The chamber and plunger of the force pump are arranged in an angular position across the reservoir. The plunger is made upon the trunk principle, about one half of its length being made tubular. The plunger is connected by a link, which works on a pin crossing the lower end of the tubular part, to the actuating hand lever, D, the lower end of which is jointed to a pair of lugs cast on the pump cylinder and projecting out over the base. The actual lifting part of the jack consists of a cylinder, E, closed at the upper end, and sliding up and down on the vertical cylinder connected with the base. The upper end of this sliding cylinder



is fitted with the ordinary tripod head piece, G, which is brought under the object to be lifted; it has also a toe piece, which projects outwards in a lateral direction from the lower part of the external or lifting cylinder, E, this part is exceedingly useful for lifting anything from the floor, a purpose to which the ordinary lifting jacks is wholly inapplicable. Upon the pump lever being put into action, the liquid is forced up the central tube so as to raise the external cylinder, any leakage of the water being prevented by a metallic or other packing, I, placed between the upper extremity of the tube and inner surface of the lifting cylinder. In this way, as the liquid is forced up the pump, the external cylinder is raised, lifting with it the object to be moved or supported. And where a longer range of lift is required, the lifting cylinders are made telescopic, so as to slide one within the other. When the jack is to be lowered, the let-off valve, F, is gradually eased to allow the liquid to escape back into the reservoir, this valve is simply a rod of metal, one end of which is pointed, and enters a hole in the central tube, H, through which the water is forced. The outer end of the valve spindle projects out through the side of the reservoir, and terminates in a thumb nut, to allow of its being screwed to and fro, and thus close or open the passage between the central vertical tube, and the chamber or reservoir in the base of the machine. This arrangement of the jack is exceedingly compact, at the same time being very powerful; its utility in the workshop is much more extended than the ordinary implement, and will prove a valuable addition to our mechanical appliances.

TURRET CLOCK IN THE NEW CHURCH OF ALL SOULS, HALIFAX.

Constructed by Messrs. John Bailey & Co., *of the Albion Works, Salford, Manchester.*

(Illustrated by Plate 257.)

In this progressive age—in this age of steam—time is required to be indicated with greater accuracy than it was a few years ago. The various means taken by the inhabitants of this globe, in different ages, have been curious and ingenious—from the time of the sun dial of King Ahaz, to the ponderous yet accurate turret clock, or the delicate watch, of the present day. If any time indicator ought to be more perfect than

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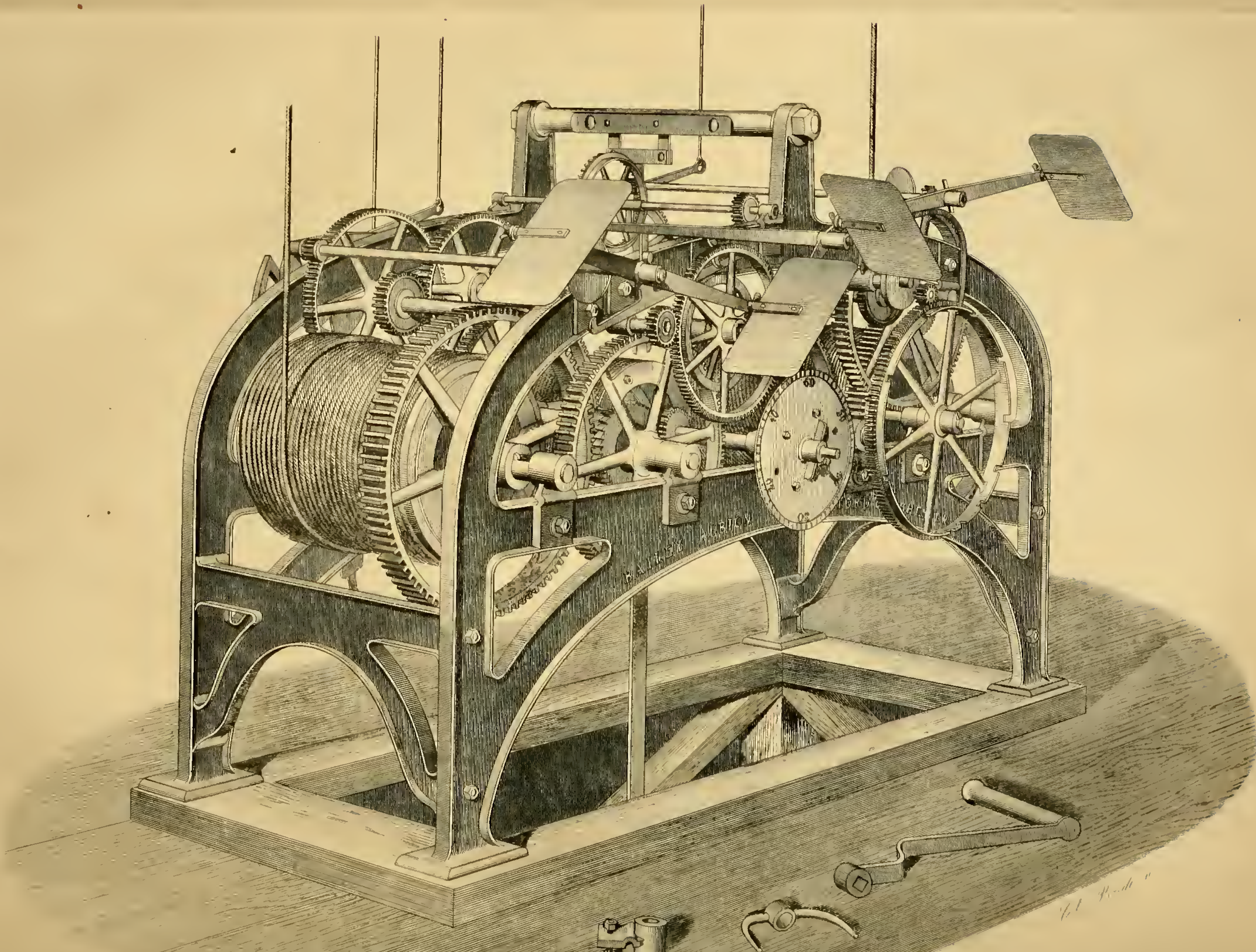
TURRET CLOCK,

JOHN BAILEY & Co. ALBION WORKS, SALFORD,

MANCHESTER.



W. Johnson, Patent Offices

another, it most assuredly must be the turret clock. It ought, if possible, to be like "the laws of the Medes and Persians, that never were altered;" for by it all minor indicators are regulated—controlling the affairs of perhaps a whole town. Notwithstanding what a turret clock ought to be—in consequence of the rude manner in which they have been made—they, generally, instead of "keeping time," have to be kept to time.

In the year 1832, a new era commenced in the art of turret clock making; for, at this period, Richard Roberts, the eminent engineer, directed his great mechanical abilities upon this hitherto much neglected horological machine; for it must excite considerable surprise that the turret clock, an apparatus of great public utility, should be in the same state with regard to improvement as it was half a century ago. The modifications introduced by Mr. Roberts have greatly improved their performing powers. and the most important source of error—friction—has been considerably reduced; and in consequence of manufacture to template, by steam power, self-acting tools, and simplicity of design, the cost of construction has been considerably reduced. Our illustrative plate 257, represents a perspective view of a clock made upon this principle by Messrs. Bailey & Co., the eminent turret clock makers, of the Albion Works, near Manchester, and placed in the tower of the new church of All Souls. Halifax, lately erected at the expense of E. Ackroyd, Esq., and from designs by G. G. Scott, A.R.A. The clock indicates the time of day upon two dials, each eight feet six inches in diameter. The arbor carriers are attached to the frame by means of bolts, and steel steady pins, in such a manner that any single wheel may be taken out without disturbing the frame. A carrier is represented detached from the clock. The clock strikes the hours upon a bell of twenty-five cwt., and the quarters upon four bells. The bells are from the well-known foundry of Messrs. Mears, London. The clock is fitted with the patent wire ropes. A set dial to set hands by maintaining power; a compensating pendulum, 156·55 inches long; the bob of which weighs 2 cwt.; the main, or great wheels, are each 18 inches in diameter; the pendulum springs are very short, to enable the point of suspension to be well defined. In the striking trains, the ordinary pin wheel for lifting the levers is dispensed with, and a snail motion with friction roller is substituted, obtaining a great reduction of friction and destructive action. A short time ago, a clock upon this principle was constructed for the Earl of Rosse. His lordship has favoured Messrs. Bailey with a letter, stating that it goes remarkably well, and "much better than large clocks usually do;" thus proving—what all the theory in the world would not, to some people—that they are good time keepers. The clock we illustrate will give the reader an idea as to their construction; and to those who are unacquainted with horological machines, its elegant and compact appearance will be sufficiently obvious as to admit of its being compared with advantage with those clumsy contrivances which usually go by the name of turret clocks.

RECENT PATENTS.

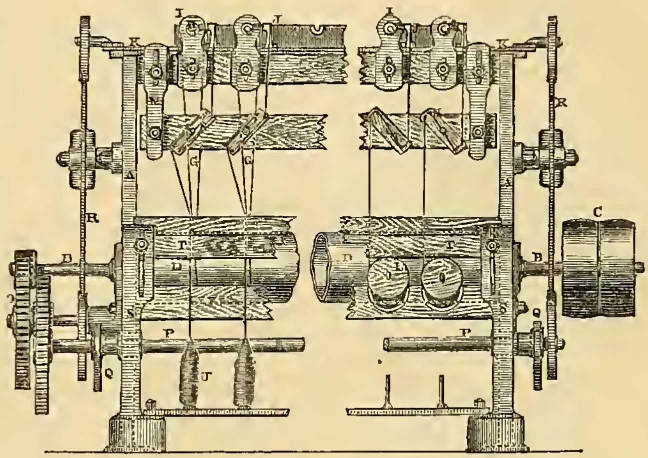
WINDING YARN OR THREAD.

Robert Fairgrieve *and* Simeon Bathgate, *Selkirk.—Patent dated June* 7, 1859.

The improvements specified under these letters patent embody in particular an effective system of automatically suspending the action of the winding spindles as each becomes full of yarn or thread, as well as minor improvements in connection with the winding machinery.

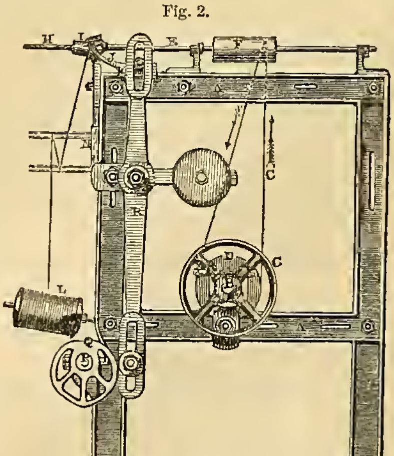
Fig. 1 on the accompanying engravings is a front elevation of the two end portions of a pirn winding machine, arranged according to one modification of the patentee's improvements; and fig. 2 is an end elevation of the right hand lateral extremity of the machine. The machine consists of an open rectangular framing composed of two end standards, A, which are connected to each other by the longitudinal lower rails, arranged at the front and back parts of the machine. A corresponding binding rail extends from the upper part of the end standards along the front of the machine—behind this rail and arranged parallel thereto are two other rails. The lower cross rails of the end standards have slots cast therein; in one pair of these slots are fitted the adjustable bearings of the long horizontal shaft, B, the extremities of which extend out beyond the end standards. Motion is communicated to the different moving parts of the machine from this main shaft, B, by means of an endless belt which is passed round the fast and loose pulley, C, and is primarily driven from a steam engine or other prime mover. The shaft, B, carries the longitudinal drum or driving cylinder, D, by means of which the whole series of spindles are put in motion. To the upper cross rails of the framing are bolted the bearing plates which support the spindles, E; these spindles run in grooves cast in the upper edges of the plates, and are arranged at right angles to the driving cylinder, D. Each spindle has fitted to it a plain cylindrical driving barrel, F, which is driven by means of an endless belt, G; the band passes round the main cylinder, D, is then half twisted and passed over the barrel, F, above, the whole series of spindles being arranged and driven in like manner. The pirns, H, on which the yarn is wound are made hollow to slip over the ends of the spindles, E, the inner end of each, towards the base, is formed

Fig. 1.



of a conical figure, and grooved on the surface so as to hold the thread thereon, the remaining portion of the pirn being of a simple cylindrical figure. Each pirn is slipped on to the outwardly extending end of the spindle, and it is caused to rotate therewith by a projecting eye, which is placed in a slot made for the purpose in the disc formed on the spindle, and against which the base of the pirn presses during the winding operation. The conical part of the pirn corresponds in figure or nearly so with the intetior of the conical mould, I, which is arranged in front of the spindle. The moulds are formed of a vertical piece of metal, which has a slot cast in it to afford the means of securing each mould to the front binding rail of the framing, and of accurately adjusting it opposite the extremity of its contiguous spindle. The conical part of the mould extends outwards in front of the upright, and it has a longitudinal opening formed at the side for the purpose of allowing the thread to be regularly wound on the pirn. The moulds are arranged opposite to their respective spindles, and they are secured to the rail by means of bolts and nuts. Parallel to each spindle is fitted a guide, J, which is bolted down to the moveable bar, K; these guides, by their reciprocatory movement, serve to lay the thread or yarn upon the pirn in an even and regular manner. Each guide consists of a base plate, having a slot made therein to admit of the requisite adjustment on the bar, K; from the base plate an arm extends outwards towards the front of the mould, at which part the arm is bent at right angles in the direction of the contiguous mould. The yarn or thread to be wound on the pirn is carried through a groove formed along this laterally projecting part of the guide. The accompanying engravings illustrate two modes of winding yarn, in one the yarn is taken from bobbins, and in the other from cops. According to the former mode a series of spindles are fixed in the longitudinal rail of the framing; on these spindles are placed the filled bobbins, L, the yarn from which is subjected to a certain amount of "drag" or tension during the winding operation. The arrangement for this purpose is fitted to a rail, which is attached to and supported by the pendent bracket pieces, M, that

Fig. 2.



are bolted to the upper binding rail of the framing. To this rail and below each mould, I, is fixed a screw or pin, which serves to support a moveable head or rectangular piece of wood, N, in the outer face of which are fixed four or other suitable number of drag wires. At one end of the head, N, is affixed a small weight; this is attached to the side of the head, and tends to keep it in a position nearly vertical when freely suspended upon its supporting spindle. The yarn or thread from the bobbins, L, is carried upwards and passed over the two upper drag wires, then under the lower ones and upwards to the guide, J, through the groove of which it passes to the pirn, H. The arrangement of the moveable heads and drag wires ensures perfect uniformity in the winding of the pirns, for if the tension is regulated so as to keep the heads, N, say at an angle of forty-five degrees or more, then upon any over-running of the bobbins, the slackness thus caused is taken up by the head falling more or less towards the vertical position. The yarn, as before observed, is laid in a regular and uniform manner on the pirns by means of the guides, J, which have a reciprocatory movement imparted to them by the motion given to the bar, K. This motion is primarily communicated from the main shaft, B, on the extremity of which, opposite to the fast and loose pulley, C, is fitted a pinion which gears with a spur wheel, O, running loosely on a stud projecting laterally from the end standard of the framing. On the boss of the spur wheel is a pinion which gives motion to the shaft, P. This shaft, P, has fitted to it the two heart wheels, Q, the peripherics of which are in contact with anti-friction rollers, the studs of which are adjustable in the slots, which are formed in the lower ends of the oscillating levers, R. Each of the levers, R, is centred on a stud carried in an adjustable bracket which is bolted to the end standard; the upper portion of the lever extends above the framing of the machine, and has a slot formed in it similar to the lower extremity. In order to keep the anti-friction roller continuously in contact with the heart wheel, Q, the lever, R, is made with a laterally projecting arm, which carries a weight. In the slot at the upper end of each lever, R, is fitted a pin, the inner extremity of which fits into a groove made in the contiguous end of the bar, K. With this arrangement it follows, that as the heart wheels, Q, are slowly rotated, the bar, K, is moved to and fro in a corresponding degree, which causes the guides, J, to traverse parallel with the pirns and so lay the thread evenly thereon. At the commencement of the winding operation the thread is attached to the pirn, H, which is then slipped on to one of the spindles, E, and the strap, G, is put over the barrel, F; in this position the greater portion of the cylindrical part of the pirn projects through the front part of the mould, I, and the strap, G, crosses the barrel, F, at the backward part, as shown at the right hand extremity of fig. 2. As the yarn accumulates upon the pirn, the pressure of the conically wound portion against the inner surface of the mould, I, causes the spindle to gradually recede, and this amount of traverse is so regulated that when the pirn is filled to the proper extent, the strap, G, slips off from the front end of the barrel, F, and the spindle consequently stops. In winding yarn from the cop it is preferred to use two end standards, S; these stand on the floor, and to them is fixed the rail on which the pins or spindles are arranged. The upper end of each standard, S, is made with an inwardly projecting part, in which is a slot that serves to carry the supporting stud or bolt of the longitudinal rail, T. To this rail is bolted arms which support an inner rail immediately below the drag wires. The cops, U, are placed upon the pins, and the yarn is carried upwards through a small hooked guide eye fixed in the front rail, T, then through corresponding eyes in the inner rail to the guide wires. For winding yarn from the cop, a different mode of carrying it round the guide wires is preferred to that hereinbefore described. The moveable head, N, is arranged with the small weight at the upper corner, and the yarn is first passed round the lower and outer drag wire, then upwards to the upper corner wire, from thence downwards in an angular direction below the opposite lower corner wire, and lastly, is carried up past the upper corner wire. From this point the yarn is carried up to the overhead guide and disposed as hereinbefore described. This machine may also be used for winding yarn from the hank, for which purpose it may, with very trifling modifications, be readily adapted. With these several improvements the operation of winding yarn or thread is effected in an easy and certain manner, the arrangement of the mechanism or apparatus insuring a regular and even laying on of the yarn upon the pirn, together with an unerring certainty in the stoppage of the spindle when the predetermined quantity of yarn has been duly wound on.

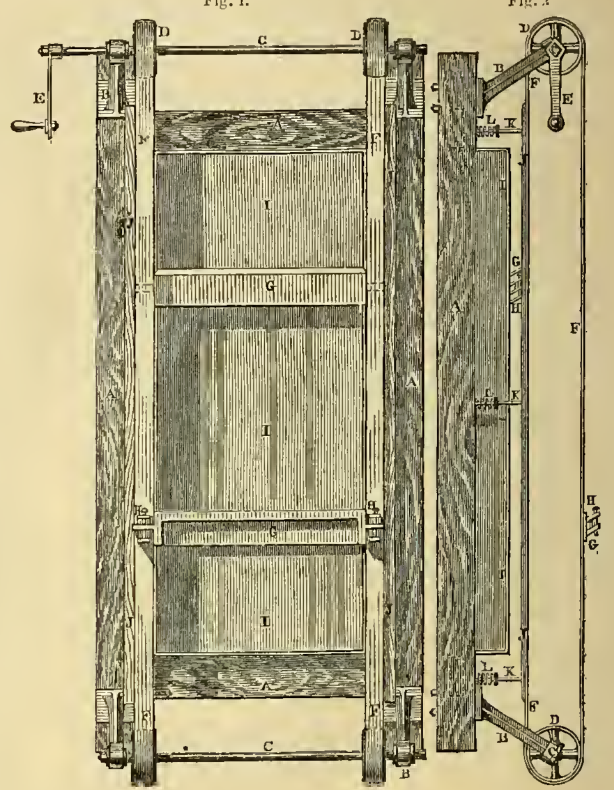
MANUFACTURE OF SHEET TIN.

J. H. Johnson, *London and Glasgow* (M. Masson, *Paris*)—*Patent dated March* 23, 1859.

The manufacture of the thin metal coverings or capsules for bottles, and other similar articles, has, within a comparatively recent period, grown up into a large and flourishing business. The present improvements relate to the arrangement and construction of machinery or apparatus for producing thin sheet metal suitable for capsules.

Fig. 1 of the accompanying engravings represents a front view of the apparatus; fig. 2 is a side elevation of the same. A, is a wooden frame fitted with two cross-bars, and secured to a wall of brick or masonry. B, is bracket bearings, fitted to each corner of the frame for the purpose of carrying the shafts, C, off the two pairs of pulleys, D, actuated by the winch handle, E, the motion of one pair of pulleys being transmitted to the other pair by the endless bands or chains, F, to which are fitted the two vessels or receivers, G, which are the recipients of the molten tin to be formed into sheets. These recipients are each attached to the endless bands or chains by the hooks, H, which keep them in constant motion during their descent when charged with metal, as well as during their ascent when empty. For producing sheet tin from tin, in the molten state, it is simply requisite to keep the charged recipients, during their descent, in close contact with an elastic web or cloth, I, stretched in

Fig. 1. Fig. 2



accordance with the contact pressure of the recipients, G. In order to moderate the pressure of these recipients, the bars, J, are employed, which are connected by the rods, K, with the main framing. These rods are provided with lateral springs, L, so as to yield more or less under the pressure of the recipients, G, according as they contain more or less metal, or as a thicker or thinner sheet of metal is required to be produced. In place of having the apparatus disposed in a perpendicular position, it may be inclined at any desired angle, whilst the manner of obtaining the requisite pressure against the cloth or elastic surface may also be modified. Any number of vessels or recipients, G, may also be fitted to the endless bands or chains, F, and any suitable material may be used for the elastic spreading surface, I.

SHARPENING THE TEETH OF CARDING ENGINES.

William Brown *and* Simeon Bathgate, *Selkirk.—Patent dated September* 2, 1859.

These improvements are designed for keeping the teeth of carding engines in an efficient state, by mechanical means connected with the engine itself, and operating simultaneously therewith.

Under one modification of the patentees' improvements, the framing and general arrangement of the moving parts of the carding engine remain unaltered. To the lower longitudinal rail of the framing, and near the periphery of the main carding cylinder, are fitted pedestal or other suitable bearings, in which is carried the spindle of a roller of wood or other material. This roller extends across the machine parallel to the main cylinder, its periphery being adjusted so as to be in contact with the points or extremities of the teeth or wires of the cylinder. The roller is by preference formed of wood, carefully built on iron rings, or it may be made wholly of iron; its periphery being coated with emery or other abrasive substance, suitable for grinding or sharpening the points of the carding teeth. This roller may be driven by means of the strap or endless band, which gives motion to the "fancy," and "strippers," or in any other convenient manner. The sharpening roller is fitted up at the back of the main cylinder, so that the "fancy" serves merely to raise the wool, or other fibrous material, on the main cylinder. The fibrous material is then stripped off by the doffer. In this way, as the main cylinder moves round, the carding teeth or wires are brought in a comparatively clear state to the grinding or sharpening roller, and by its rotatory movement, they are effectually sharpened; the speed of the grinding roller being properly adjusted for this purpose. Under another modification, the teeth or wires of the "workers," and other rollers of carding machinery, are kept in a highly efficient state by automatic means. In this modification, the "ordinary strippers" "and angle strippers," which are arranged above the main cylinder, and in immediate contiguity to the workers, and "intake," or breast roller and middle doffer, are constructed with a strip or strips of wood arranged at intervals on their peripheries. The strips of wood extend from end to end of the strippers, the surfaces of the wood being slightly higher than the extremities of the card teeth, the surfaces of the wood are covered with emery, or other abrading material. The cards are arranged in the usual manner for sheet cards, and the strips or fillets fill up the intervening spaces, about one inch in width between the cards. One strip or fillet is in general sufficient on each of the strippers, but more may be used if they are considered necessary, especially in the case of "angle strippers," which work upon the intake roller or upon the middle doffer, in addition to the "worker." With this arrangement, as the "strippers" work in concert with the workers and the other rollers hereinbefore mentioned, the rapid passage of the emery covered strips of wood in contact with the teeth or wires of the cards, causes these to be maintained in a most efficient state. With these improvements, the carding operation which forms an important feature in the preparation of fibrous materials is effected in a very superior manner, and the inconvenience and loss of time arising from the dulness or wearing down of the card teeth, and defective work occasioned by the "strippers" getting out of order are wholly avoided. Strips or fillets of wood covered with emery as described, may also be used between the cards on the "fancy," for the purpose of keeping the cards on the main cylinder sharp and smooth, instead of the separate grinding roller described, but the patentees prefer using the grinding roller as being more efficient for the purpose.

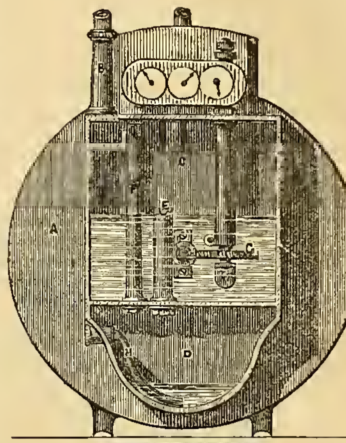
GAS METERS.

J. Z. Kay, *Dundee.—Patent dated October* 26, 1859.

The passing of a recent Act of Parliament for securing a more equitable measurement of gas, has put the gas engineers on the *qui vive* to produce a meter of simple construction, which shall protect alike the interests of the consumer, and the vender. Among the latest improvements in this branch of mechanical science, are the meters of Mr. J. Z. Kay, to which we now direct attention.

Fig. 1, of our illustrative engravings, is a vertical section of one of the patentee's gas meters, taken through the front box of the meter, into which the gas issues from the main. Fig. 2 is a transverse sectional plan corresponding to fig. 1. Fig. 3 is a sectional elevation of a compensating meter, arranged according to the patentee's improvements in this class of meters, the sectional line passing longitudinally through the valve box at the back of the meter. Fig. 4 is a transverse section of a portion of a meter, corresponding to fig. 3. In the arrangement delineated in figs. 1 and 2, the meter case, A, containing the measuring drum, is of the ordinary kind. The gas as it flows from the street main, passes down the inlet pipe, B, into the front box, C, which is divided into two compartments by a horizontal partition, the lower compartment, n, serving as a receptacle for the waste water. The water is prevented from rising beyond the pre-determined level, by the overflow pipe, E, which carries the surplus water down into the chamber, D. The gas which is displaced by the overflow of water to the chamber, D, passes up the pipe, F. The overflow pipe, E, is furnished with a lateral branch, which conveys the gas into the measuring chamber, A, the rotation of the measuring drum being indicated by means of the ordinary clock-work movement, connected with the wheel, G. Any excess of water in the chamber, D, may be allowed to flow off when necessary by the curved pipe, H. To the back of the meter is screwed, or formed thereon, a rectangular box, I, which is divided by means of partitions into four compartments. One partition, J, extends upwards nearly to the top of the box, I, and into this compartment, the filling tube, K, opens. The top of this filling tube being perforated with small holes, opening to the interior of the box, I, so as to allow the air or gas to escape while the meter is being charged with water. The space between the partition, J, and the opposite side of the box, I, is divided by the arched partition, L, and below this is a smaller rectangular compartment, M, which communicates with the interior of the meter case, A. Rising above the cover of the compartment, M, is the vertical tube, N, which extends close up to the arched partition, L, but not so close as to prevent water from flowing down the tube. The lower portion of the tube, N, extends downwards a very short distance below the proper water level required to be maintained in the meter. When water is poured into the meter by the filling tube, K, the water fills the compartment, and flows over the partition, J, into the next compartment. The water passes under the arched partition, L, and as it rises upwards therein, it drives the contained gas or air down the tube, N, and having expelled the whole of the gas or air, the water flows down the tube and into the drum or meter case, A. As the water is filled into the drum, it flows into the front box, C, and having reached the predetermined level, the surplus quantity runs down the overflow pipe, E, into the chamber, D. The gas after being measured by the rotatory movement of the measuring drum, flows through the opening, O, in the box, I, and passes off to the burners by the outlet pipe, P. This pipe, P, where it enters the second compartment of the box, I, is curved to keep it clear of the arched partition, L, and it terminates within a very short distance of the surface of the water contained in the compartment. The lower end of the outlet pipe, P, is shaped into a conical figure and flattened, sufficient area being preserved for the due emission of the gas to the burners. One mode of applying the hydrostatic valve box, is to arrange it in the front box of the meter, and in order to prevent tilting, the overflow pipe is arranged at the back of the meter, and is carried along the bottom, and thence into the waste water box. In this modification, the gas is conveyed first into the waste water box, and then, by a gas siphon, into the measuring drum. By this means, a corresponding water level is obtained in the front chamber, and in the drum case, both being subject to the same pressure of gas. Figs. 3 and 4 represent a partially sectional elevation and plan of one arrangement of the improved wet gas meters, constructed upon what is known as the compensating principle, in which a uniform water level is maintained by means of a reservoir attached to the meter. To the back of the meter is attached, or is formed thereon, the valve box, I, one portion of which is divided off by the vertical partition, J. At the upper part of this partition is a laterally projecting piece, through which passes the filling pipe, K. Extending laterally from the top of the partition, J, towards the right side of the box, I, is the partition, L, which is curved downwards, and terminates near the bottom of the chamber, I. The space thus far enclosed is again divided by the partition, M, which is made with a bend at the centre, through which passes the tube, N. In filling this meter

Fig. 1.



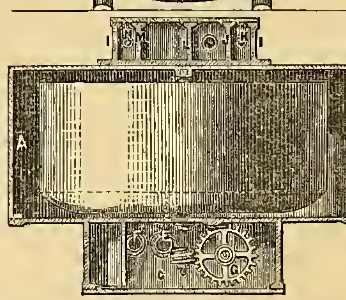
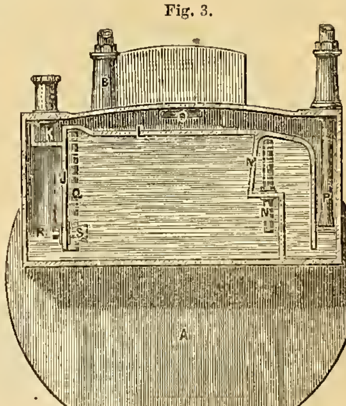


Fig. 2.

Fig. 3.



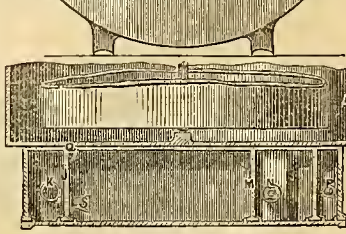


Fig. 4.

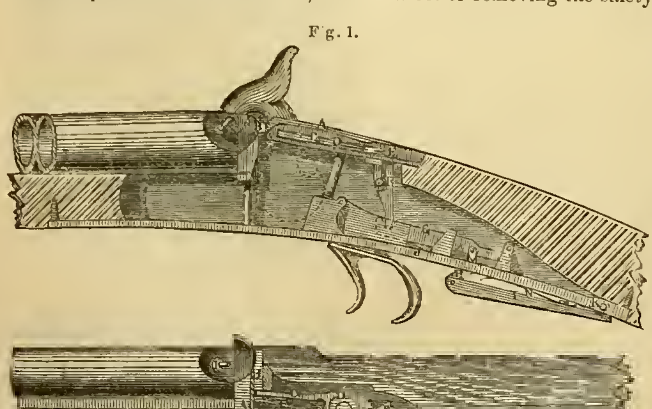
with water, it flows from the filling tube, K, along the compartment above the partition, L, downwards into the space in which the outlet pipe, P, is arranged, and as the water rises, it completely fills the compartment between the partitions, L and M. The air or gas is expelled down the pipe, N, and the water then flows down and fills the compartments into which the pipe, N, opens at the lower part. This central compartment being closed at the upper part, it is completely filled with water, the air or gas previously contained therein escaping by the small vertical chamber or division, Q. This being an open fountain, the water flows under the partition, J, and rises in the equilibrium chamber, R, the water flowing from this compartment into the measuring chamber, through the orifice, O, and thence into the front box, where the overflow pipe is arranged. The object of the equilibrium chamber, R, is to prevent water from the fountain passing into the drum case at every variation of the pressure. The gas passes from the measuring chamber through the aperture, O, and away by the pipe, P, to the burners. In the partition, J, there is fitted a short conically-shaped tube, S, which is arranged in a slot or other contrivance, so that it may be easily moved up and down. This tube is placed at the proper water level, so that as the water evaporates, small bubbles of gas pass through the tube, S, from the equilibrium chamber, R, and into the reservoir; these bubbles of gas displace a corresponding quantity of water, which flows through an aperture made for the purpose, and communicating with the measuring chamber. In this manner, the evaporation of the water is fully compensated for, and a constantly uniform water level is maintained by self acting means, which are free from liability to error. The arrangement of this meter, also effectually prevents fraud by tilting, for if the meter be thrown forward, a portion of the water in the drum case escapes by the overflow pipe into the waste water chamber, the water level at the back being then too low, the conical tube, R, becomes opened so that gas passes into the reservoir. This admission of the gas causes a portion of the water to flow into the drum case, and from thence into the front box and down the overflow pipe. This continues until the water in the reservoir falls below the mouth of the tube, N, which destroys the equilibrium of the columns of water, and the immediate stoppage of the flow of gas to the burners ensues. This compensation valve chamber, may be as readily attached to a meter of the ordinary kind, as the arrangement shown in figs. 1 and 2. These improvements in apparatus for measuring gas, are adapted to ensure an accurate and equitable registration of gas between the supplier and consumer.

FIRE-ARMS.

JOSEPH ATKINSON, *Lancaster.—Patent dated July* 14, 1859.

ACCORDING to this invention, the ordinary safety guard, which has hitherto been made to act upon the triggers only, is combined with a laterally-sliding safety bolt, or pair of bolts, according as the invention is applied to a single or double-barrelled gun, which bolt, or bolts, is, or are, contained within the false breech of the piece. These safety bolts are acted upon by the usual safety guard when the gun is raised to the shoulder in the ordinary mode of firing, the fingers naturally depressing the safety bars, which, by the aid of a wedge piece working between the ends of a pair of horizontal levers, has the effect of removing the safety

Fig. 1.



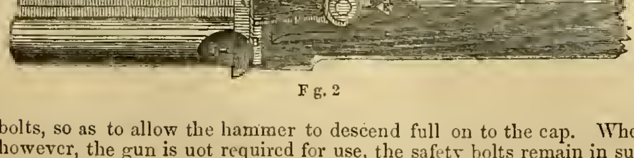


Fig. 2

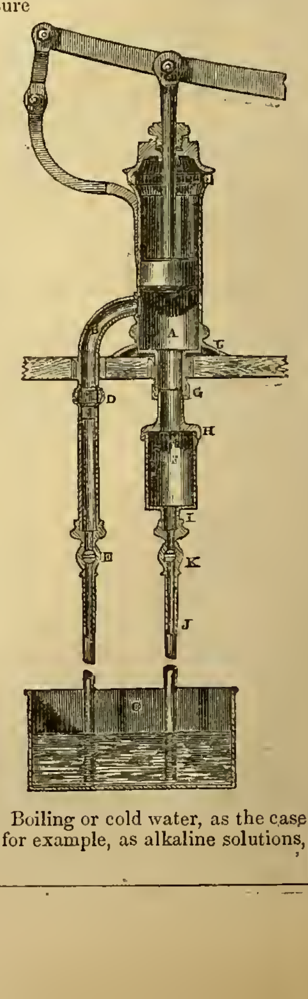
bolts, so as to allow the hammer to descend full on to the cap. When, however, the gun is not required for use, the safety bolts remain in such a position as to interpose themselves in front of the hammer shank, and thereby prevent all chance of the hammer reaching the cap, even though the trigger be accidentally pulled when the lock is on full cock.

Fig. 1 represents an elevation of so much of a double barrelled gun lock as is required to illustrate the improvements; and fig. 2 is a corresponding plan of the same, with the top plate or false breech removed to show the points of novelty. A, is the false breech, within which slide freely in slots or grooves the two safety bolts, B, one for each hammer. The safety bolts slide in and out laterally, so that when slid outwards they will obstruct the fall of the hammer or hammers. A cross cut or groove is made in the inner end of each bolt, in which grooves are engaged the free ends of the longer arms, C, of the levers, which turn at the joint, D, on a raised boss or projection, formed on the underside of the top plate The short arms at the foot of these levers each carries an antifriction roller or pulley, which pulleys are operated upon by a triangular wedge-piece, E, formed on the upper end of the short vertical lever, F, working on a fixed centre or fulcrum screwed to the under plate. The lower end of this lever is engaged in a notch, formed in the end of a horizontal sliding bar, G, working longitudinally in guides on the under strap, J. This bar is connected by a link piece, H, with the safety bar or lever, I, working on a fixed centre, K, in the underside of the strap, J. In holding the gun for firing, the right hand grasps the stock, and the fingers naturally force upwards the free end of the safety bar or lever, I, which through the intervention of the link piece, H, forces back in the guides the horizontal bar, G. This backward movement of the bar, causes the upper wedge-shaped end, E, of the lever, F, to advance between the antifriction pullies on the short arms of the levers, D, and force them outwards, thereby simultaneously drawing inwards the longer arm, C, of the levers, and with them the safety bolts, B, so as to remove them out of the way of the hammers. On releasing the safety bar or lever from the pressure of the fingers, the doubled-bladed spring, L, between the levers, D, forces them outwards again, and returns the bolts to their position of safety, whilst the blade spring, N, depresses the safety bar in readiness to be again operated upon when required.

APPARATUS FOR MAKING PHARMACEUTICAL PREPARATIONS.

JOSEPH WAITE, *Cheltenham.—Patent dated August* 9, 1859.

MR. WAITE's improvements comprehend an apparatus for making medicinal infusions under hydrostatic pressure



The accompanying engraving represents a vertical section of the patentee's apparatus for making infusions, tinctures, essences, or extracts. A, is the barrel of a force pump, provided with a tight-fitting piston, worked by the lever handle, shown partly broken away. The lower end of this pump is communicated by means of a side pipe, B, with a vessel, C, containing the water, spirit or other liquid to be used in preparing the infusion or tincture. This pipe is provided with a foot valve, D, and also with an ordinary stop-cock, E. The bottom of the pump communicates also by means of the nozzle, with the cylindrical vessel or chamber, F, connected thereto by a union or other suitable joint, G, and provided with a tight-fitting screwed cap, H. A nozzle, I, is formed on the bottom of this chamber, F, and is screwed into the top of the pipe, J, which also dips into the vessel, E, and is furnished with a stop cock, K. The entire apparatus may be secured to a table or other support by means of screws passed through the wide flange or plate, L, formed on the bottom of the pump barrel, A. In preparing an infusion by this apparatus, the union joint, J, is first unscrewed, the cover or cap, H, of the chamber, F, is removed, into which is introduced the ingredients from which the infusion is to be prepared. The cap is screwed on again tightly and the chamber connected by means of the union joint coupling with the pump, A. Boiling or cold water, as the case may be, or medicated solutions, such, for example, as alkaline solutions, should now be pumped up through the pipe, B, which is then closed by turning the stop-cock, E. The water or medicated solution thus contained within the pump barrel, is now forced downwards, by depressing the piston into and through the ingredients contained in the chamber, F, and if boiling water be used, it is allowed to remain there a few minutes by closing the cock, K. This cock having been again opened, the water is forced by further depressing the piston through the ingredients into the vessel, C, into which the pipe, B, also dips. The cock, K, is again closed, and the cock, E. in the pipe, B, opened, and by elevating the piston again, the same liquid which has now become a comparatively weak infusion, is drawn into the pump again and again, and forced through the ingredients in the chamber, F, continuing to repeat the operation until the infusion is of the proper strength, or until all the virtue is extracted from the ingredients which will generally occur in the space of from six to eight minutes.

It will be found advantageous to have several chambers, F, of different sizes, but all fitting the one pump separately, so that a longer or shorter chamber may be used according to the quantity of ingredients to be operated upon.

JACQUARD MACHINERY FOR WEAVING.

JOHN SHIELDS, *Perth.—Patent dated October* 5, 1859.

MR. SHIELD's improvements relate to various arrangements of Jacquard loom or machinery, so as to secure a more effective system of operation in weaving. Fig. 1 of the accompanying engravings is a partially sectional elevation of one modification or arrangement of the improvements in Jacquard apparatus. Fig. 2 is a plan showing a part of one row of the needles, and fig. 3 is a plan of the mechanical arrangement for throwing the vertical wires on and off the brander. The Jacquard cylinder, A, is arranged to actuate by means of the endless chain of perforated cards, B, four or other number of rows of pattern needles. As delineated in the accompanying figures, there are four rows, C, D, E, and F, of these needles, the action of which form the pattern in the fabric to be woven. The front ends of the pattern needles project out through the guide, G, so as to be either pushed back by the card, or allowed to pass through the holes made therein, for the purpose of raising the yarn in the required order, to form the predetermined pattern or figure. The backward end of each pattern needle is formed into a loop or elongated eye, which part passes between the horizontal wires extending across the box, H, and through the several loops of each vertical row of needles is passed a retaining wire, I. Each of the pattern needles is caused to actuate two or more of the vertical hooked wires or "cleeks," J, by forming in each pattern needle two or other convenient number of loops or elongated eyes, K, as delineated in the plan of four of the pattern needles shown in fig. 2. In the position in which the pattern needles are shown in fig. 1, the needles, C and E, are in their normal position, the ends passing through corresponding perforations in the card, B, which at the time is in contact with the inner face of the Jacquard cylinder, A. But the needles, D and F, being kept back by the solid parts of the card, prevent a certain number of the vertical wires, J, from being hooked on to the horizontal bars of the "brander" or lifting board, L. Thus the needle, D, moves back the fourth, fifth, and sixth vertical wires, J, out of the way of the brander, and the yarns which are passed through the "mails" or eyes of the harness connected to these wires, remain unaffected by the upward motion of the brander, L. So also with the pattern needle, F, which has only two loops or eyes, K, formed in it, and through which the ninth and tenth wires, J, pass, these wires are consequently kept back clear of the brander, L, by the position in which the card, B, keeps the needle, F. Each of the vertical wires or needles, J, are kept up to the front part of the loops, K, in the pattern needles, C, D, E, and F, by causing them to pass through the eyes of the lower series of horizontal needles, M. These needles correspond in number to those of the vertical wires, and each one is made with an eye, N, through which the wire, J, passes. The front ends of the needles, M, pass through the guide, O, the backward extremities being carried between the bars of the box, H; these ends are looped, as shown in the plan fig. 2, and there is attached to each one, one end of a helical spring, P, which serves to press the needle, M, forward when not otherwise acted upon. The other extremity of each helical spring, P, is fastened to the back part of the box, H, the gentle pressure of the spring on the end of the ueedle, M, causing it to carry the wire, J, to which it is attached, forward to the front part of the loop, K, of the pattern needles, C, D, E, and F. The twilling of the fabric is effected by means of the mechanical arrangement which is fitted below the ueedles, M. This consists of a series of cams, Q, which form the twilling barrel, these cams are arranged contiguous to each other on the shaft, R, so as to act in concert on the rods, S. These rods are supported on the end standards, T, they are flat metal bars, each of which has upon its upper face, two bosses, U, in which are fixed the laterally extending rods, V. The vertical wires, J, are continued downwards so as to form long loops, W, the upper parts of which rest upon the rods, V, as shown in fig. 1 of the accompanying engravings. As the cams, Q, come round, the projecting parts of the peripheries push the rods, S, forward, which causes the wires, J, that are connected with the rods so actuated, to turn slightly upon their centres, the fulcra of the several wires, being the eyes, N, in the needles, M. This motion of the wires, J, throws back their upper hooked ends clear of the brander, meanwhile those wires, J, which are required to be brought into action to effect the twilling, are done so by the rods, S, being moved in a contrary direction. This is effected by the receding or concave part of the cam or cams, Q, coming opposite to the end or ends of the rods, S, the rods being moved backwards by the springs, X, which keep the rods continually in contact with the peripheries of the actuating cams, Q. In this manner the sequence of movements of the harness which is attached to the operating wires, J, is effectively provided for, to obtain the twilling of the fabric, irrespective of the pattern mechanism. The position of the vertical wires for twilling the fabric as they are moved to and fro by the action of the twilling barrel, Q, and springs, X, is indicated by dotted outline figures in fig. 1. In these outlines the fourth and ninth of the wires, J, are clear of the brander, whilst the second and sixth wires are pushed forward, so that the yarns which they are designed to lift will be raised with the upward movement of the brander. The Jacquard barrel is caused to be actuated at regularly recurring intervals of time, according to the number of shots of weft desired to be thrown in between each movement of the barrel. This is effected by means of latches or snecks lying across the upper part of the barrel, which are brought into gear with the Jacquard at the proper intervals, so as to suit the design or pattern and produce it according to the predetermined size. These improvements not only simplify the arrangement of the Jacquard mechanism, but render it better adapted for application to looms which are actuated by steam power.

Fig. 1.

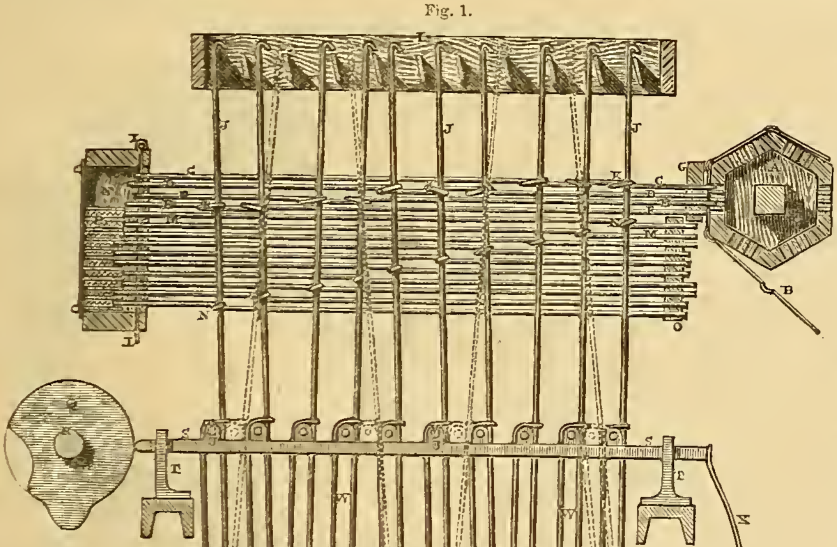


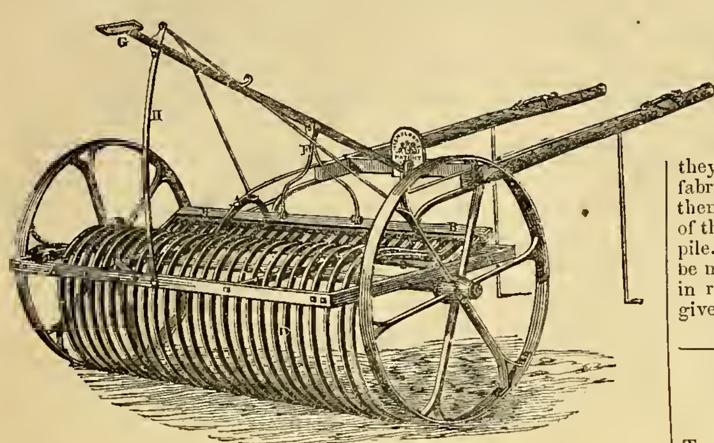
Fig. 2.

Fig. 3.

HORSE RAKES.

JOSEPH NICHOLSON, *Whitehaven.—Patent dated September* 8, 1859.

THE patentee's invention relates to a peculiar construction and arrangement of lever horse rake for hay, corn, stubble, or weeds, whereby the teeth of the rake are balanced so as to afford greater facility for freeing them from the collected matter. In carrying out this invention, there



is applied to the inside of the main framing of the rake a secondary frame, working on a transverse bar, or rod, extending from side to side of the main framing. The heads of the several teeth are carried by, and work freely upon the front portion of the inner or secondary frame, which is connected by a double forked connecting rod to an overhead hand lever, the back free end of which works in or against a segmental guide. By depressing this lever, and engaging it into a catch or notch, the teeth will be elevated from the surface of the land, and maintained so elevated until the release of the lever again. A moveable catch, fitted on to the segmental guide bar, enables the lever to be maintained elevated, and the teeth raised to any desired height above the ground. The inclination of the points of the teeth is also capable of being regulated by adjusting the height of the main frame in conjunction with the greater or less elevation of the lifting lever, this adjustment of the frame being accomplished by means of slotted quadrants and tightening screws.

The accompanying engraving represents a perspective elevation of the improved horse rake. A, is the main framing of the rake, and, B, the inner or secondary frame, working on the transverse bar or rod, C, which extends from side to side of the main framing. D, are the teeth of the rake, the heads of which are carried by, and work freely upon, a transverse rod, which connects the two ends of the inner frame, B. The front part of this inner frame is formed of angle iron, and this angle iron bar has connected to it the forked connecting rod, or link, F, which is attached at its upper extremity to the lever, G, working on a fixed centre at F. The rear or free end of this lever is guided by working against the side of the segmental guide bar, H, bolted to the back part of the main framing. There is a moveable catch, in the form of a clip, gripping the guide bar, and capable of being fixed at any desired elevation thereon by means of a set screw. This catch serves as a rest or support for the rear end of the lever. A second catch, or notch, is formed at the bottom of the guide bar for the purpose of holding the lever down, and maintaining the teeth elevated when the machine is not at work. By suitably adjusting the height of the catch, and regulating the height of the main framing, A, by the aid of two slotted quadrants, which are jointed to the main framing, and carry the axle of the running wheels, the teeth may be set to work more or less on their points, as may be desired.

BRUSSELS AND VELVET PILE CARPETS.

JOHN THOMSON, *Dundee.—Patent dated November* 8, 1859.

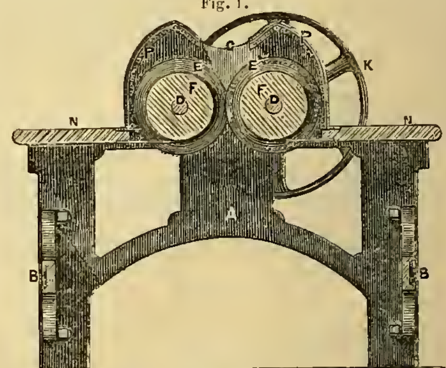
IN manufacturing Brussels and velvet pile fabrics according to this invention, jute, or jute hemp, is woven or manufactured in power looms similar to what are at present used in the manufacture of Brussels and velvet pile carpet fabrics from wool, or wool and other materials combined; or in power looms of a generally similar arrangement and construction. The back of the manufactured goods may be composed of any suitable fibrous material, or combination of materials. The Brussels and velvet pile fabrics manufactured according to this invention from jute, by the agency of power looms, are produced at a cheaper rate than has hitherto been the case; whilst their external appearance, and general effect, are very much superior to those of ordinary fabrics of the same class, and they are much more durable. In the preparation of jute for the manufacture of Brussels and velvet pile fabrics, the jute is spun into yarn, dyed, and otherwise prepared for the manufacture, in the same manner as wool, or other fibrous material, is prepared for weaving. The prepared jute yarn is used in the loom in the same way as the woollen yarn is ordinarily used to form the surface of the fabric. If the fabric to be woven is of the looped class, as in Brussels carpeting, the jute yarn is woven in over wires, or other loop-forming mechanism—the binding in of these loops, as well as the formation of the cloth at the back, being composed of linen or cotton yarn, or a combination of other suitable fibrous materials. In the manufacture of fabrics having a velvet pile surface or face similar to what are known as Wilton carpets, the loops of the jute yarn may be made somewhat deeper than those of the Brussels carpeting, and these loops, as they are formed, are cut through by means of suitable mechanism. The fabric, when completed as far as the weaving operation is concerned, is then passed through a cropping machine, so as to cut off the uneven ends of the cut loops, and reduce the surface to a uniform level, or velvet-like pile. In this way, looped or cut pile fabrics may, by the use of jute yarn, be manufactured at a cost far below woollen goods, and but little inferior in richness of appearance, provided due care and attention has been given to the preparation and dyeing of the jute yarn.

MACHINERY FOR CUTTING RAGS.

JAMES COX, *London.—Patent dated June* 18, 1859.

THESE improvements comprehend the arrangement and construction of a machine for cutting or dividing rags or other materials for paper-makers. Fig. 1, of the subjoined engravings, represents a transverse vertical section of the improved machine for cutting rags or other materials for paper-makers; and fig. 2 is a plan corresponding. The cast-iron end standards, A, are connected together by longitudinal cast-iron stretchers, B, which are secured by bolts to the standards. To the top edge of each standard are bolted two plummer blocks, C, in the bearings of which work the two cutter shafts, D. Each of these shafts has threaded on to it a number of circular or disc-shaped steel cutters, E, the peripheries of which are bevelled off, so as to form cutting edges, and slightly overlap each other. Between the several cutters are interposed the collars or discs, F, which are also threaded on to the cutter shafts, and serve not only as supports to the cutters to prevent them from buckling or becoming bent or twisted, but also answer the purpose of distance pieces, for keeping the cutters of each series asunder, the width of these collars regulating the width of the strips of cut rags. In order to facilitate the proper tightening up of the cutters, a shoulder, G, is formed on each shaft, against which the series of cutters are pressed by screwing up the nuts, H,

Fig. 1.



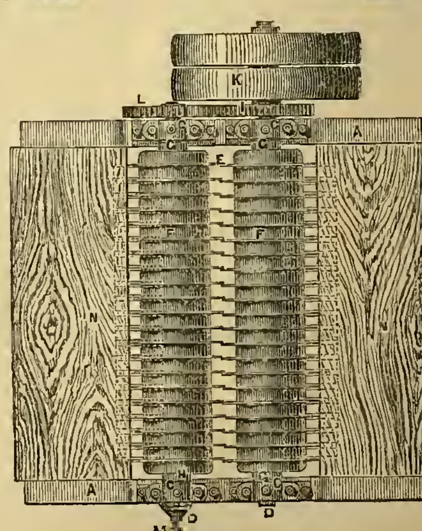


Fig. 2.

which work on screw threads cut on the shafts and bear against the opposite ends of each of the set of cutters, so as to tighten up each series, and hold them securely. The shaft, D, is extended beyond the end standard, in order to carry the spur wheel, I, and pair of fast and loose driving pulleys, K, and the other shaft, D, carries a spur wheel, L, gearing into the wheel, I, but of rather larger diameter than that wheel; by which arrangement one set of cutters will revolve rather faster than the other, and thereby produce a draw cut between their overlapping peripheries. The left hand shaft, D, is capable of longitudinal adjustment in its bearings, for the purpose of facilitating the proper lateral adjustment of the two sets of cutters, as regards each other. This may be accomplished by means of a set screw, M, working through a projection on the plummer block, and bearing against the end of the cutter shaft, the set screw being prevented from shaking loose by the ordinary arrangement of jam nuts. N, are two tables upon which the rags, or other material to be cut, are placed, and are thence removed by the hands of two attendants, and introduced through the longitudinal feeding aperture, O, in the top of the protector or guard, P, so as to fall between the two series of cutters. On the inner edges of the undersides of the tables, are secured a series of metal tongues or plates, which bear against the underside of the intermediate collars or discs, F, and act as clearers for removing any portions of rag or other material which may be adhering thereto, the cut strips or fragments falling into a receptacle below, or on to the floor of the workshop.

VALVULAR APPARATUS.

JAMES FYFE, *Greenock.—Patent dated November* 24, 1859.

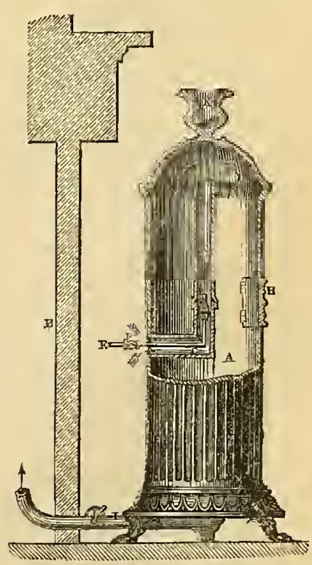
THE improvements specified by Mr. Fyfe, relate to the arrangement and construction of valvular apparatus for regulating and adjusting the pressure of water and other liquids in their passage through pipes or other ducts; the apparatus being especially suited for regulating and adjusting the service pressure of water supplied from high pressure mains of water works. Under one modification of these improvements, the valvular apparatus consists of two sections of a main shell or valve chamber, screwed or otherwise attached together. The lower section of this chamber has a vertical tubular passage, which forms the inlet pipe, opening into the lower part of the chamber, and an outlet pipe which branches off in a lateral direction from the upper part of the valve chamber. The internal surface of the inlet pipe is tapped to receive the longer tubular extremity of the stationary portion of a cylindrical equilibrium valve, which is screwed or otherwise fitted into the inlet pipe, so that the water flows up through the interior of the valve, and out through lateral openings made in the upper part of the valve; and in addition to this thoroughfare, provision is made for the upward passage of the water through external hollows or recesses, formed in the stationary section of the valve. The moveable portion or section of the equilibrium valve consists of an open metal frame-piece, embracing the fixed portion, and having a valve face turned or formed upon the upper side of an annular portion, which forms the lower end of this section. The top of the stationary section of the equilibrium valve, has a flange upon it, and is faced upon its lower side with India-rubber, or other elastic material; and it is this faced flange, in conjunction with the face upon the annular portion of the moveable section, which forms the actual valvular passage. Above the moveable portion of the valve, there is fitted upon it, or upon its spindle, which passes up through the centre of the upper division of the main shell, an elastic diaphragm of India-rubber or other material, held circumferentially by being screwed between the flanges of the sections of the main shell. The spindle of the moveable portion of the valve is jointed to an eye piece upon the top of that portion, and it is encircled by a helical spring contained in the upper section of the main shell, which spring abuts between a metal plate upon the top of the flexible diaphragm, and the lower end of an adjustable nut-piece, screwed into the top of the upper section of the main shell, the spindle being passed loosely through such nut, free. The spindle is screwed to receive another nut upon its extreme end, which nut is for the purpose of closing the equilibrium valve when necessary by drawing up the moveable portion of it, and thus bringing the two faces on the stationary and moveable portions of the valves into contact. The lower nut operates only upon the helical spring in the upper part of the main shell. With this arrangement—when the equilibrium valve is open—the high pressure water from the main flows directly through it, and passes off to the service pipes by the lateral branch hereinbefore mentioned, no operative pressure being given to the valve, by reason of its being of the equilibrium or balanced pressure class. Then, to reduce the pressure of the effluent water, all that is necessary, is to turn the nut regulating the helical spring, so as to diminish the reactive pressure of the spring. The high pressure water then acts upon the flexible diaphragm, and through it draws up the moveable portion of the equilibrium valve, and thus correspondingly diminishes the water way, and reduces the fluid pressure upon the service pipe. Instead of using a flexible diaphragm for the action of the valve in adjusting the equilibrium valve, a piston, or a cupped piece of leather, or other material or contrivance, may be adopted. The object of this detail being merely the giving an actuating area of larger size than that of the equilibrium valve. Instead also, of the helical spring, an adjustable weighted lever may be adopted for regulating the action of the apparatus. The regulation of the pressure of the helical spring may also be effected by the revolution of eccentric inclined pieces, instead of by a nut.

According to another modification of this apparatus, the adjustment of the flow and pressure is effected by means of a species of triple valve. This valve is composed of a main spindle piece fitted into the main shell to operate as in the former instances. The bottom end of this spindle has fitted upon it a cupped leather or other disc, or a piston, which fits into a short bored cylinder or valve case set in the interior of the inlet pipe, and having a set of lateral openings in it, above the level of the cup-disc or piston. The bottom end of this cylinder is solid and air-tight, and thus the cup-disc or piston has always air beneath it. Immediately above this valve, there is a valve-faced flange upon the spindle, capable of bearing against an elastic or other face, fitted within the main shell. This forms the stop, or opening and closing valve; the upper end of the spindle, within the top section of the main shell, also has upon it a cupped leather piston or other contrivance fitted within a bored cylinder or valve case, which cylinder may be formed within the actual main shell. This valve or moveable detail is of larger area than the one at the bottom of the spindle. The spindle is prolonged upwards, and fitted with a cap-nut or other detail for pressing down a helical spring upon the top of the upper larger valve; and its extreme end has also a nut for setting up the intermediate valve to stop the thoroughfare. An air-way is formed through the body of the spindle, for the purpose of opening up an air communication between the two cylinders or valve chambers, in which the discs or pistons work. The principle of the action of the second modification, is the same as that of the one hereinbefore described. The upper valve or piston of the series being larger than the lower one, the influx of high pressure water tends to close the valve, and this action is modified and adjusted entirely by increasing or reducing the reactionary pressure of the helical spring upon such larger valve.

GAS STOVES.

CHARLES CHALMERS, *Edinburgh.—Patent dated November* 15, 1859.

UNDER these letters patent, Mr. Chalmers has produced a cheap and very convenient form of gas stove, which is admirably adapted for heating bedrooms and other apartments. The stove is so arranged that the air in the room cannot be vitiated by any portion of the products of combustion escaping. The accompanying engraving is a partially sectional elevation, showing one arrangement of the patentee's gas stove. The stove consists of an ornamental casing, A, formed, by preference, of iron, this casing forms a cylindrical chamber, which is closed at the upper part by a decorative cupola. The stove is, by preference, placed near to a chimney, B, which serves as a channel to carry off the air which is vitiated by the combustion of the gas. At the back part of the stove, a tubular passage, C, is made, which is continued inwards to the centre of the chamber, A, and is then bent upwards at right angles, to the extent of a few inches. This tubular passage forms an inlet for the due supply of air to the burner, D, which is arranged at the upper part of the tubular passage C, and is attached to the gas supply pipe, E. The flow of gas to the burner is controlled by the cock, F, outside the stove, the other portion of the pipe, E, being connected to the gas main from whence the supply for the house is obtained. The pipe, E, is arranged centrally in the air passage, C, and the air flows equally round and up through the central aperture in the burner, so as to ensure an ample supply of air for the complete combustion of the gas, and the efficient heating of the apartment. The burner used for the purpose may be one of the Argand kind, or one arranged with concentric flames, and known as the "Bude burner," or any other suitable arrangement may be applied, according to the amount of heat required from the stove. To the upper end of the air passage, C, is fitted a copper or other metal chimney, G, this chimney serves the purpose of the ordinary gas glass in drawing up the flame and more effectually



consuming the gas; at the same time, it being a better conductor, the heat from the burner is more quickly radiated. The chimney, G, is carried up into, or near to, the cupola of the stove, so that the upper part becomes highly heated, and this heat is given off by radiation to the surrounding atmosphere. The large amount of radiating surface forming the exterior of the stove, serves to heat quickly the air of an apartment, and raise its temperature to a genial and pleasant warmth. At the front part of the stove is a door, H, by means of which the gas is ignited. The vitiated air and gaseous products of combustion are carried down to the lower part of the stove by the continuous inflowing current of air which is drawn in through the tubular passage, C, by the combustion of the gas. This burnt air and the products of combustion, are carried away by the pipe, I, which passes out from the bottom of the stove, and is carried into a neighbouring chimney, B, or direct to the external atmosphere. The outlet pipe, I, is fitted with a throttle valve, J, for the purpose of controlling and regulating the emission of the heated air to suit the consumption of gas in the stove, and the amount of radiated heat required in the apartment. In cases where it is required to supply the air of the apartment with a certain amount of moisture, the upper part of the cupola terminates in an ornamental vase, K, for holding water, the slow evaporation of which supplies the requisite amount of humidity. In this way, large or small apartments may be economically heated, the heating medium being so perfectly under control, that its services may be brought into use, or dispensed with, at the instant required. These stoves, when manufactured in plain metal, may be produced at a very small cost, and be readily adapted to rooms where an ordinary stove would be inadmissible, or they may be got up with every attention to external decorative effect, so as to harmonise with the fittings of the apartment in which they are placed.

PROJECTILES FOR RIFLED ORDNANCE.

William Benson, *Fourstones, Hexham.—Patent dated October* 6, 1859.

The patentee's invention relates to certain peculiar constructions of solid or hollow cylindro-conoidal projectiles, and consists in the application to shot or shells, or to a combined shot and shell intended for muzzle or other loading rifled ordnance, as the case may be, but more particularly for muzzle loading, of a wedge-shaped jacket or covering of lead, or similar soft metal at the hinder part of the projectile, and extending with a gradually tapering thickness towards the front part of the same; the base or extreme hinder part of this jacket being of a convex or concave form, as found desirable, but the patentee prefers to make it concave.

Fig. 1.

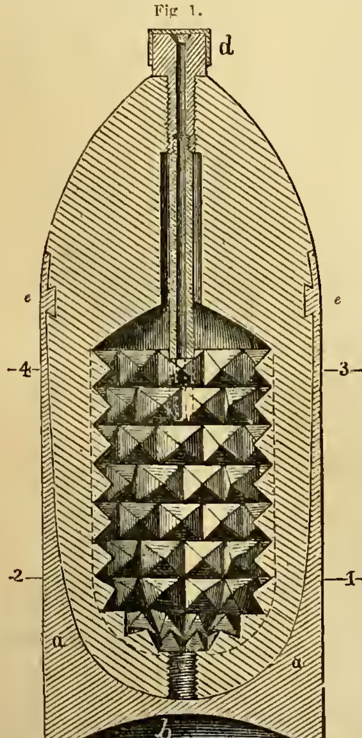
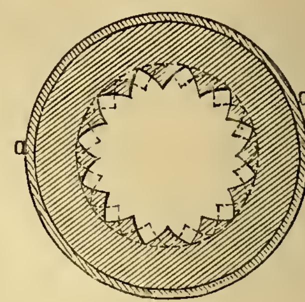


Fig. 1 represents a longitudinal section of a cylindro-conoidal shell with the improved soft metal jacket applied thereto; fig. 2 is a transverse section taken along the line 1, 2, in fig. 1, and showing the inner surface of the rear end; and fig. 3 is a similar section, taken along the line 3, 4. The body of the projectile, has cast round it or applied, in any other convenient manner, the leaden jacket A, for the purpose of enabling the same to be fired from a muzzle or other loading rifled gun; but more particularly the muzzle-loading gun, the projectile being easily inserted into the gun in loading, but fitting it tightly when fired by the expansive action of the gases upon the rear concave end of the jacket. The projectile itself is made slightly conical or tapering towards its rear end; but its true cylindrical outline is restored to it by the application of the leaden jacket, A, which extends along its sides as far as the commencement of the front or conoidal end, where it is held secure by means of a dovetailed annular groove, E, cut or cast round the projectile. It will be seen that the thickness of the metal composing the jacket gradually increases from the front to the rear end of the projectile in the form of a wedge, and a slight chamber or cavity, *b*, is formed in the rear end of the jacket to admit of the efficient action of the gases in expanding the jacket into the rifled grooves of the gun. The core hole, in the case of hollow projectiles, is filled up by a screwed plug, *d*, after the core has been

Fig. 2.

Fig. 3.



removed. The jacket is shown as applied to a percussion shell, of which *d* is the cap and fuse. The interior cavity of the shell is also represented as being cast with internal cross grooves or chequered work for facilitating the rupture of the shell into a number of equal or nearly equal parts. The action of the explosive gases, when the gun is fired upon this soft metal jacket, will, from the peculiarity of its shape, necessarily force it into the grooves of the rifled ordnance, and so impart the desired rotatory motion to the projectile. And, further, it will be the means of partially deadening the sudden shock which the projectile receives from the gases, and thereby prevent the possibility of fracturing it before leaving the gun.

REEFING AND FURLING SAILS.

R. F. Finlay, *Liverpool.—Patent dated January* 23, 1860.

These improvements comprehend a simple, but very effective mode of reefing and furling the topsails of ships from the deck of the vessel. Fig. 1, of the subjoined engravings, represents an elevation of the fore part of a topgallant sail; fig. 2 is the after view of the sail with Capt. Finlay's improvements applied thereto; A, is the inhaul of the sail; B, the outhaul; C, the upper spilling line; D, the lowering spilling line, and E, the buntline. The following is the mode of fitting the yards:—Take off the jackstay, and countersink an iron rod on the top and another on the after-quarter of each yardarm—from the inner part of the sheeve holes to the slings—so as to permit their taking the pressure of the rings and making them run smoothly. Place on each yardarm a sufficient number of rings according to the size of the sail, to bend the head to, taking care to allow at least an inch of play. Have a cheek, fitted with a sheeve, at the fore part of the yard, abreast of the royal sheet sheeve, for the outhaul, B, (the one pin answering for both sheeves); a block or lignum-vitæ bull's-eye, having been seized close into the tie at either side, for the inhaul, A, the yard can then be sent aloft. A rope is then permanently fixed at the masthead—same as the lifts—and rove through the block or bull's-eye in the bunt (the sail being bent to the rings and hauled close in), and the ends are clinched to the head cringles. A similar rope is then rove through the quarter block, through the sheeve or cheek at the yardarm, and also clinched to the head cringle, and when the yard is mastheaded and the sail set, these ropes are to be hauled taut, and secured for a full due to the trussel trees, and both upper and

Fig. 1.

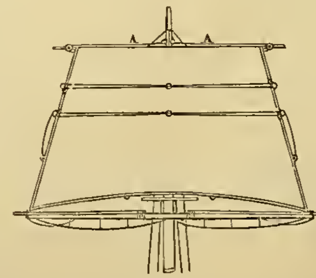
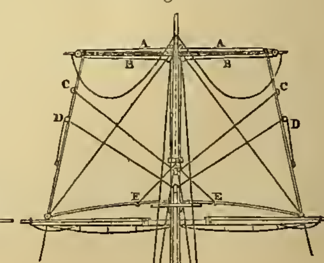


Fig. 2.



lower ropes then remain a permanent fixture; so that when the haulyards are let go, the head of the sail is brought close into the bunt, and by hoisting the yard the head is drawn out. The yard itself forms a jackstay.

A ship adopting this invention does not require to alter the original sails, but merely to have a lignum-vitæ bull's-eye placed in the fore part, as shown in fig. 1, of the sail (in the centre) for the spilling lines—the upper one about eighteen inches from the head, and the lower about one foot *above* the centre in the bunt; a criugle on each leech, abreast of each bull's-eye. The sheets and clewline are rove as usual, but the buntline, E, (a single leg) is to be rove abaft, instead of before, the sail. The spilling lines, C and D, are to reeve through a leading block abreast of the bull's-eyes in the sail when the yard is on the lifts—the starboard leg passing through the cringle on the starboard leech, through the bull's-eye in the sail, and clinching to the cringle ou the port leech, and *vice versâ*. The clewlines to be rove inside the spilling lines—abaft. In taking in the sail, the haulyards are first let go, the clewlines hauled up, and the buntline must be hauled up before the spilling lines. When squalls are not of any duration, let go the haulyards, haul taut the spilling slides, keeping the sheets fast. Both mast and sail are then perfectly secured, and the sail can be reset in a moment.

In reefing topsails a master has a choice of plans. First, he may let go the inhaul, keep the sail out to the yardarm, and reef by the present system of tying the points round the yard, but with this advantage, that the lower spilling line will brail the body of the sail to the mast, and give security to the meu on the yard. Secondly, let go the haulyards, and when the sail is in at the buut, unbend the outhaul, secure it to the first, second, or third reef cringle, as may be needed by the weather, shorten the outhaul to correspond with the reduced sail, and lengthen the inhaul to the same extent. The inhaul and outhaul can be belayed on the lower masthead, or they can be made fast on deck. Thirdly, to dispense with sending a man aloft, even to change the ropes, which is done in the bunt: reefing lines can be passed through cringles along the reef bands, up through the rings on the yard, aud when the sail is in to the mast, hauled taut. Whichever of these is adopted, there is a gain in freedom from accidents. But apart from this method of running sails in and out of rings on the yard, Capt. Finlay has another plan of reefing topsails from the deck in which he dispenses with the dicky-yard. He also reefs his courses by reeving the clew-garnets *forward* of the sail, hooking a tackle on to a cringle in the foot of the sail secured to the deck, which serves as a sheet. This done, the clews are hauled up and the sail stands in the form of a triangle, and, as the leech is in the sail, can be quickly furled. The clews are single ropes, and no block is necessary at the sheet. In scudding, this form of sail will stand when a reefed course will not. A band on either side, to take the pressure at the fold of the sail, is desirable.

SHIRTS.

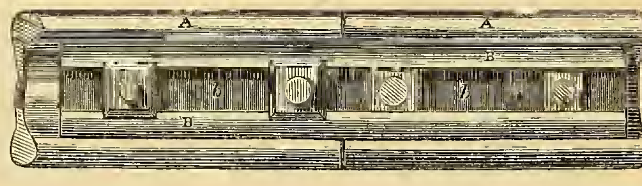
W. W. Kennedy, *Glasgow.—Patent dated October* 26, 1859.

Mr. Kennedy's improvements relate to the arrangement and manufacture or construction of shirts of various classes and qualities, in such manner as to insure good fitting and comfort and freedom in wearing; whilst the shirt is much simpler in structure than the ordinary kind, it is also cut out with greater facility, and in fewer parts than other shirts. In cutting out the parts of shirts according to this system, the front portion of the body is cut in one piece, and is carried upwards to a greater extent than in the ordinary mode of cutting. This elongation of the upper part of the front piece is so shaped as to form a yoke-shaped piece extending over the shoulder and uniting at the back of the neck. Thus, the front portion of the shirt is cut at the sides to fit tolerably close to the figure of the wearer, and is then curved inwards to form the larger portion of the arm holes. The cloth of which the front part is formed, is then cut in a slightly curved direction. The curved space in which the linen front is inserted, is formed by cuttiug out the front to a corresponding extent. The back part of the shirt is cut to correspond to the sides and arm hole portion of the front part, the upper part of the back is, however, cut sufficiently wide to admit of its being fulled in at the central part of the yoke piece when made up. A "binder" which extends downwards, and crosses the front part, is stitched in below the shoulder parts. These binders extend over the shoulders to the full extent of the yoke piece, and they are seamed together in a line corresponding to the central or back seam of the yoke piece. The front and the neck band, as well as the sleeves, are of the ordinary kind. In shirts cut according to these improvements, the cloth or upper portion of the front part is on the bias, that is to say, the warp and weft of the cloth gradually diverge into a diagonal direction towards the shoulder part, the yoke piece being quite on the bias. This disposition of the cloth gives a degree of elasticity to the shoulder parts of the shirt, which causes it to sit much better round the neck than if cut in the ordinary way. The carrying of the front part of the shirt over the shoulders, also does away with the shoulder straps, so that the wearing of these straps by the rubbing of the braces is done away with, and a greater degree of comfort ensured to the wearer through the absence of these extra folds or thicknesses of cloth upon the shoulders.

LAW REPORTS OF PATENT CASES.

Harwood and Others *v.* The Great Northern Railway Company.—This was an action in which the plaintiffs sought to recover damages for the infringement of a patent granted to Mr. Charles Heard Wild, on the 16th of March, 1853, for "improvements in fishes and fish-joints for connecting the rails of railways." It appeared from the specification that in securiug the joints of rails it had been found advantageous to attach pieces of iron to each side of the rail, by means of bolts and nuts, and such pieces of iron were commonly called "fishes." Chairs had beeu constructed on a similar principle to support one side of the rail, while a fish was applied at the other side, and secured to the chair by bolts and nuts. The patentee described his iuvention as consisting in forming a recess or groove in one or both sides of each fish, so as to reduce the quantity of metal at that part, and to be adapted to receive the square heads of the bolts, which are thus prevented from turning round. This peculiar construction of "fish" is represented at figs. 1, 2, and 3, which are reduced copies of the drawings annexed to Mr. Wild's

Fig. 1.



specification. In these figures, A A, are the rails, and B B, the "fishes," each of which is made with a groove or recess at *b*, in the outer surface, which groove serves to receive the square heads of the bolts, and prevent them from turning round, when the nuts are being screwed on or off. Square washers are placed in the groove of the fish to allow of the nuts being turned round, or the fish on this side may be made without the groove. He also stated, as an advantage of his invention, that the groove renders the fish lighter for equal strength, or stronger for equal weight of metal, than a fish which is made of equal thickness throughout, and summed up his claim in these words:—"The constructing fishes for connecting the rails of railways with a groove adapted for receiving the heads of the bolts or rivets employed for securing such fishes, and the application of such fishes for connecting the rails of railways in manner hereinbefore described." The action has been already twice tried—on the first occasion before Lord Campbell, when the defendants obtained a verdict; and on the second occasion before Lord Chief Justice Cockburn, when, upon the finding of the jury, his Lordship directed the verdict to be entered for the plaintiffs, but gave the defendants leave to move. Subsequently a rule was granted by this Court to show cause why the verdict should not be set aside and entered for the defendants, pursuant to leave reserved at the trial, upon the ground of the invention not being the subject of a patent, by reason of the previous use of grooved iron in timber bridges (other than the Hackney bridge) for the double purpose of obtaining increased strength for the same weight of metal and preventing the bolt-heads turning round; or why a new trial should not be granted upon the ground of misdirection by the Lord Chief Justice with respect to the application and use of the grooved iron in the Hackney bridge. Fig. 4 is a representation of the grooved iron, above

Fig. 2.

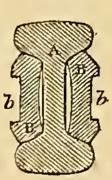


Fig. 3.

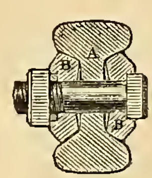
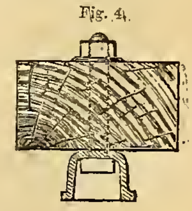


Fig. 4.



referred to, as having been used in the construction of timber bridges, prior to the date of Wild's patent, and which although really acting as a "fish," was not applied with that intent.

Mr. Knowles, Q.C., Mr. Grove, Q.C., Mr. Hindmarsh, and Mr. Webster now appeared for the plaintiffs to show cause against the rule; and Mr. Bovill, Q.C., Mr. C. Pollock, and Mr. Horace Lloyd for the defendants.

The argument occupied the whole day, and in the result, the Court discharged the rule, upon the ground that although grooves had previously been in use for the purpose of strength and preventing the heads of bolts from turning round, there was invention in their application to the construction of "fishes," for connecting the rails of railways. The Court also thought there had not been any misdirection, for although it was true that Mr. Brunel in the construction of the Hackney bridge, had used a channelled iron which acted as a "fish," it was clear that he had not used it with that intent, nor indeed was he aware that it acted in that way; and it was therefore no misdirection when the Lord Chief Justice told the jury that the use of channelled iron as a "fish" in the Hackney bridge, under those circumstances, would not invalidate the patent.

The question in dispute in this action is of great interest in the railway world. It is understood the plaintiffs represent the Permanent Way Company, and as they have now obtained the final judgment of this Court in their favour, there can be little doubt that the defendants, who, with all the other railway companies, are deeply interested in the result, will carry the case by appeal to the Exchequer Chamber.—Judgment for the plaintiffs.

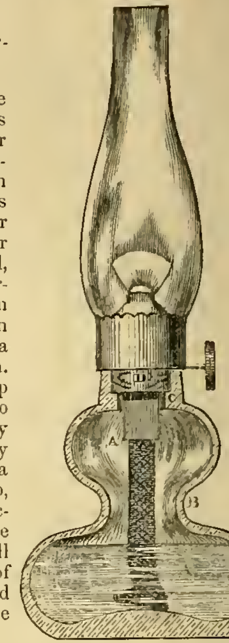
Pottery Furnaces—Smoke Consuming Apparatus—Doulton *v.* Stiff.—In vol. 4, p. 155 of this journal, we reported the trial of this action at the sittings after Trinity Term, 1859. At the trial some points were reserved for the defendant to move upon. The verdict for the defendant was founded upon a prior use by Mr. Green, of a pottery furnace which included all the elements of the plaintiff's alleged invention, except the perforated tiles, and consequently was precisely analogous to the arrangement used by the defendant, and which the plaintiff contended was an infringement of a material, although subordinate, part of his invention. Mr. Green's arrangement is illustrated by fig. 5 in the report referred to. The plaintiff in Michaelmas Term last moved for and obtained a rule for a new trial, on the ground that Mr. Green was mistaken in his evidence as to the date when he first adopted his arrangement of furnace. The defendant at the trial proved cases of prior user of pottery furnaces other than Mr. Green's, containing all the elements of the plaintiff's invention, except the perforated tile and the *descending flue*. One of these latter cases of prior user was that of John Ferguson mentioned in the before-mentioned report. In Hilary Term the defendant moved for and obtained a rule to show cause why the verdict entered for the plaintiff on the second and third issues should not be set aside, and a verdict entered for the defendant on those issues instead thereof, and also on the first issue, (on which a verdict had already been obtained by the defendant) on the ground that there was no evidence of infringement to go to the jury; that the *descending flue* formed no part of the plaintiff's invention or arrangement, and that the prior publications proved, and cases of prior user (other than Mr. Green's), admitted at the trial, showed that the invention as claimed was not new, and not the subject of a patent. The only question argued upon this rule was, whether upon the true construction of the plaintiff's specification he had claimed as an element in his combination or arrangement the *descending flue*. If he had not, then the defendant had not infringed the plaintiff's patent, for although the defendant had used a combination or arrangement of a chamber over the fireplace—means of regulating the admission of air into the chamber, and a descending flue, yet, inasmuch as the chamber and means of regulation in combination were old—and especially shown in Ferguson's furnace—if the plaintiff was not entitled to claim the descending flue in combination, the defendant would not infringe the plaintiff's patent by using it. Counsel having been heard for the plaintiff, the Lord Chief Justice Cockburn said he was of opinion that the rule should be made absolute. The question was whether the defendant had infringed the plaintiff's patent, and that question depended on whether the plaintiff had claimed the descending flue as part of his invention. The invention consisted of three parts—the chamber in which the air became heated; the perforated tile or plate, which became heated to an intense heat, and by passing through which the air became still more heated; and the descending flue, through which the air descended, and so came in contact with the smoke. The question was whether the plaintiff had patented the last, the descending flue; for, if he had not, the defendant had not infringed his patent. His lordship thought, looking at the specification, that the plaintiff had *not* claimed the descending flue. At the same time, his lordship expressed an opinion that the plaintiff had discovered a useful combination, and he would have been glad if he could have given a decision in his favour. But it was clear that the plaintiff considered the perforated tile (which had not been used by the defendant) as the very essence of his invention, and he did not claim the descending flue, by which the air descended upon the smoke. Mr. Justice Crompton and Mr. Justice Hill were of the same opinion. The rule was accordingly made absolute to enter the verdict for the defendant on the first issue as to the infringment, and discharged as to the other two issues.—Rule accordingly.

Mr. Bovill, Q.C., Mr. Lush, Q.C., and Mr. Webster, were counsel for the plaintiff; Mr. Knowles, Q.C., and Mr. Hindmarsh, instructed by Mr. J. Henry Johnson of Lincoln's Inn Fields and Glasgow, were counsel for the defendant.

REGISTERED DESIGNS.

HYDRO-CARBON LAMP.

Registered for Mr. William Bailey, *of Horseley Fields Chemical Works, Wolverhampton.*



The purposes of utility to which the shape or configuration of the new parts of this design refer, are the facility of carrying or hanging up, and the economy of manufacture. The engraving exhibits the design drawn one-third of the full size, the letters marked thereon referring to the particular parts hereafter described. A, is the reservoir or holder for the oil or other liquid used, and is formed with a neck, B, for the purpose of giving a better hold to the hand in carrying, also for greater convenience in hanging up when required; C, being a ledge for the cork rim, D, to rest upon. The fitting of the upper part of this lamp is such as to render it perfectly safe, so that it may be overturned with impunity without spilling the contents. Mr. Bailey has, in this design, not only produced a pleasing and even elegant form of lamp, but has carried the economy of manufacture to the extreme verge: for we have here a highly useful lamp, complete in all respects, and adapted for burning either of the liquid hydro-carbons, produced and sold retail for the marvellously low price of one shilling.

VIOLIN.

Registered for Mr. John Tye, *Agnes Street, Waterloo Road, London.*

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REVIEWS OF NEW BOOKS.

Engineering Precedents for Steam Machinery; embracing the performances of Steamships, Experiments with Propelling Instruments, Condensers and Boilers. By B. F. Isherwood. 2d Vol. pp. 231. Lithographs. Ballière. 1859.

On the appearance of the first volume of this work, we had occasion to congratulate the author upon his having collected and given to the world a valuable series of engineering facts.* We have now before us the second volume, in which the results of the author's careful observations and researches have been set forth with the same amount of diligent attention which characterized the first part. The first paper in this volume describes the experiments made at the New York Navy Yard to determine the evaporative efficiencies of the hard or true anthracite, the Trevorton semi-anthracite, and the Cumberland semi-bituminous coals—the three kinds in general use for steam vessels and land engines on the Atlantic coast of the United States. The experiments were very carefully conducted; and they are described and the results tabulated in a paper occupying 38 pages of the volume. The author states—"these are the only rigorously comparative and reliable experiments ever made for this purpose, and they were extended over a length of time and with the consumption of a weight of coal sufficient to neutralize errors and secure accuracy in the results." The second paper is on "The economic effect due to the use of steam expansively," which forms a sequel to the first. The third paper is "Experiments made in April and May, 1859, on the multi-tubular boiler of Thomas Prosser, at 28 Platt Street, New York, by Chief Engineers, B. F. Isherwood, W. E. Everett, and J. W. King, U. S. N., by order of the Navy Department." From this elaborate paper we make a lengthened extract, in order to put our readers in possession of the particulars of an invention about which there has been a good deal of controversy among American engineers. The Prosser boiler, although inadmissible for general purposes, has, nevertheless, been successfully employed for steam fire engines, for which it is admirably adapted from its lightness, strength, and little bulk, especially on the ground plan. The small quantity too of water that it contains is for this purpose the highest recommendation, because it permits steam to be raised in a few minutes from the lighting of the fire.

The question as to the most economical mode of generating steam is an endless one. So long as steam continues to be the great mechanical power, so long will engineers work hard for the obtainment of cheaper and cheaper modes of producing it.

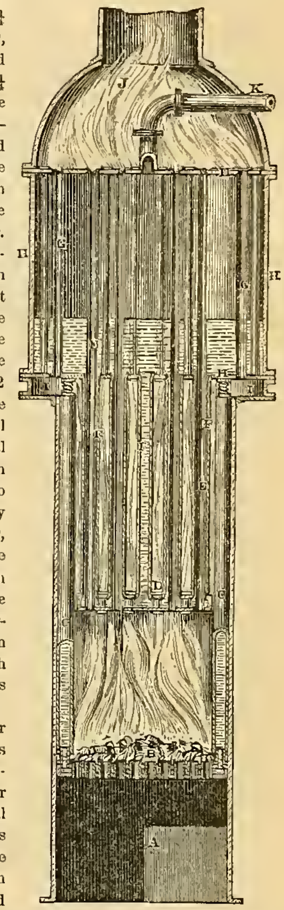
Mr. Prosser, of New York, has recently done a good deal for the advancement of the practical science of steam-making, and we now furnish an account of the result of his exertions:—

The point of difference between the multi-tubular boiler of Mr. Prosser and others of the same type, consists in the *ensemble* of the tubes and the tube plates. The peculiarity is purely a mechanical one and does not involve any new application of physical principles, nor is it attended with any difference of result as regards the generation of the steam or the combustion of the fuel. The heat is developed and applied to precisely the same kind of surfaces and in the same relative position; and the steam is generated and treated throughout in precisely the same manner as in all boilers of this type.

A conception may be obtained of the Prosser boiler from the following description of the one experimented on at New York; reference being had to the subjoined figures which represent it in elevation and in detail, showing the mode of securing the tubes.

First, as regards the tubes and their plates: Suppose a rectangular box or hollow parallelopipedon, 17 inches square and 1¾ inch in height, to be placed immediately over the fire-grate and 19½ inches above it; this box is called by the inventor a hollow slab. Immediately above it and at a distance of 28 inches there is placed a hollow cylinder, H, of 30 inches diameter and 26 inches height: the axis of the cylinder is vertically over the centre of the slab. Into the *upper* side of this slab and *lower* end or base of the cylinder there are fastened twenty-five iron tubes, F, of 2 inches external diameter and 28 inches length in the clear; and through each of these 2 inches tubes—with the exception of the centre one—there is passed an iron tube, E, of 1¼ inch external diameter and 55¾ inches total length, one end of which is fastened into the *lower* side of the slab and the other end into the *upper* end or top of the cylinder, H. These tubes are thus disposed in pairs, the tubes of each pair having their axes coincident and forming an annular space between them. The water occupies the interior of the slab, the annular spaces between the 2 and 1¼ inch tubes, and the lower part of the cylinder to the depth of 6 inches: the cylinder may be made of any height required to give the necessary steam space above the water. The 1¼ inch tubes pass, of course, through and through both slab and cylinder.

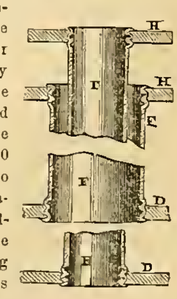
In order to fasten the ends of the 2 inches tubes to the base, D, of the cylinder and to the upper side of the slab, there must be made in the upper end or the top of the cylinder, H, and immediately opposite to the tubes, holes of about 2¼ inches diameter, which, after the 2 inches tubes, F, have been secured to their two plates, are closed by screw plugs into which the upper ends of the 1¼ inch tubes, E, passing through the 2 inches ones, are in their turn fastened. The hollow slab is composed of 5-16th inch thick iron plate; the top and bottom are got out in separate pieces with an edge turned up on the four sides, these edges are then dowelled together by wrought-iron pins and the whole being heated the halves are welded together.



The slab, D, is a little less in horizontal dimensions than the fire-grate, B, immediately over which it is placed; this is requisite in order to allow part of the products of combustion to pass up around the sides and obtain access to the outside of some of the two inches tubes. To allow the remainder of these products to reach the outside of the rest of the 2 inches tubes the top and bottom of the slab are perforated and connected across by short vertical tubes or thimbles 1¾ inch long and 1¼ inch external diameter, one of which occupies the centre of each square formed by four 2 inches tubes. In order to carry the products of combustion into the chimney from the space surrounding the 2 inches tubes, F, the upper and lower ends of the cylinder, H, are similarly connected by iron tubes, G, of 1¼ inch external diameter and 26½ inches length—the height of the cylinder: these tubes are placed vertically immediately over the corresponding ones in the slab beneath, and it is by passing a brush through them that the outside of the 2 inches tubes are swept of soot.

The fire-grate, B, is a hollow parallelopipedon or slab 1¾ inch in height and 18 inches square; its top and bottom are perforated and connected directly across by one hundred short vertical tubes or thimbles 1¾ inch in length and 1 inch in external diameter. This slab is filled with water and forms a water-grate upon which the combustion of the coal takes place, the air obtaining access to it from the ash-pit, A, beneath, through the one hundred thimbles.

A row of iron tubes, C, 2 inches in external diameter and 44½ inches long in the clear, touching along their entire length and having no interval between, is placed around three of the four sides of the water-grate and connected with it so that the interior of the tubes and of the grate communicate. These tubes rise vertically and passing the slab that forms the crown of the furnace, are fastened into the base or lower end of the hollow cylinder, H; thus joining the water spaces of the grate and cylinder, and forming the sides of the furnace, and enclosing the space around the pairs of tubes between the lower end of the cylinder and the slab that forms the crown of the furnace. Immediately above the fourth side of the grate and separated from it by a space 1¾ inch high, is a hollow slab 1¾ inch thick, 15 inches wide, and 10 inches high, forming the lower portion of the front of the furnace. This slab contains water, and the two sides of 15 by 10 inches are perforated and connected directly across by forty-two short horizontal tubes or thimbles of 5-16th inch external diameter and 1¾ inch length; through these thimbles air is admitted into the furnace above the solid fuel according to the plan recommended by Williams. The opening or door for firing the furnace is through this slab, and is a semi-circle of 11 inches diameter, the diameter coinciding with the top of the slab and the curve being below. The space above mentioned of 1¾ high which intervenes between the grate and this slab, is for the purpose of slicing up the fires and raking out the ashes and refuse; it also admits air to the solid part of the fuel. Immediately above the hollow slab just described and separated from it by a space of 1¾ inch, there is another hollow slab of 1¾ inch thick, 15 inches wide, and 8½ inches high, forming the upper portion of the front of the furnace; this slab contains water also and communicates with the one beneath it through two short vertical tubes—one at each end—of 1 inch external diameter and 1¾ inch length in the clear. Into the top of this slab and communicating with it, there is fastened a row of vertical iron tubes, D, similar to the row already described around three of the sides of the grate. The tubes are 2 inches in external



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* *Practical Mechanic's Journal* for April, 1859, p. 16.

diameter and 25 inches in length in the clear; they touch each other along their entire length and have their upper ends fastened into the base or lower end of the cylinder, thus joining the water spaces of the two hollow slabs that form the furnace front with the water space of the cylinder, and making the fourth side of the space around the pairs of tubes between the lower end of the cylinder and the slab that forms the crown of the furnace. The rows of 2 inches tubes, F, just described and which form the four sides of the boiler below the cylinder, are fastened at their extremities in the following manner, namely: The ends—top and bottom—are closed up solid; they are then tapped and into them are screwed short pipes $1\frac{3}{4}$ inch long in the clear for the bottom and $2\frac{1}{2}$ inches long in the clear for the top end; the thread is cut upon the whole length of these pipes and before they are screwed into the ends of the tubes two nuts are placed on each pipe; the remaining end of each pipe is then screwed either into the top of the hollow slab or into the base of the cylinder as the case may be, after which the nuts are set up to form a joint. The periphery of the cylinder overhangs the square water-grate slab equally on its four sides, and each projecting segment contains fifteen iron tubes, of $1\frac{1}{4}$ inch external diameter and $26\frac{1}{2}$ inches length, through these tubes part of the products of combustion pass on their way to the chimney. These products obtain access to the $1\frac{1}{4}$ inch tubes, E, through the spaces $\frac{3}{8}$ inch wide by $2\frac{1}{2}$ inches high, between the short pipes which connect the upper ends of the 2 inches tubes with the base or lower end of the cylinder.

The cylinder is surmounted by a hemisphere, J, of the same diameter, and the products of combustion from all the tubes, E, are received into it and discharged through a chimney 12 inches in diameter placed at the summit.

The steam-pipe, K, has an interior diameter of $1\frac{1}{2}$ inch; it rises from the centre of the upper end of the cylinder, describes a quadrantal arc through a portion of the dome, and passes out horizontally to the engine.

The feed-water enters through a pipe of 1 inch diameter which passes entirely through the hollow slab that forms the upper part of the furnace front and discharges into the hollow slab that forms the crown of the furnace. The inventor deems it essential that the feed-water should be received into this particular slab.

The exterior of the vertical rows of 2 inches tubes which form the four sides of the boiler between the cylinder and water-grate, was cased up with boiler plate which descending 16 inches below the grate formed the ash-pit.

From the foregoing description of the boiler, it is obvious that its use is only practicable with distilled or absolutely pure water, as its evaporating surfaces are wholly inaccessible. Even river or spring water could not be used, for the slight deposit from it would soon choke up the 5-16th inch annular space between the double tubes. It is indeed proposed to use it with distilled water only, but as it is manifestly impossible to rely with certainty on the perfect action of any surface-condensing and recuperating mechanism, it would be absurd to adopt a boiler which in the event of a failure of the full supply needed of distilled water would render the machinery useless.

The exteriors of the 2 inches double tubes are very difficult to sweep of soot; and in the event of leaks in most of the tubes, either in their length or joints, it would be impossible to discover the tube or place, and if discovered, the removal of the tube, and its replacement would require a great deal of time and labour, and possibly a degree of skill not always to be commanded.

For marine purposes the height required by this boiler is inadmissible except for vessels of the largest size; the least height in which it could be placed with due regard to cleaning and repairing being 14 feet. It is true that the extreme height of the experimental boiler was $8\frac{3}{4}$ feet, but in order to sweep its tubes or replace them the dome and chimney had to be removed. This is practicable enough with a boiler whose greatest horizontal dimensions is $2\frac{1}{2}$ feet—about that of a large stove—but with boilers of the dimensions required for steamers of the most moderate size, the idea of such an operation is not to be entertained.

The novelty as regards this boiler consists, as has been observed, in the arrangement of the tubes in conjunction with the hollow slabs, by which means the steam pressure for all parts except the hollow cylinder is exerted within two inches diameter tubes, upon $1\frac{1}{4}$ inch and 1 inch diameter tubes, and within hollow rectangular slabs of the very shallow dimension of $1\frac{3}{4}$ inch in one direction while in the other their flat surfaces are braced about every inch by the tubes themselves. The hollow cylinder itself is, it is plain, precisely the same except in proportions as the hollow slabs; in fact it is a deep, instead of a shallow slab, and round in plan instead of rectangular. If the depth of the hollow cylinder could have been made the same as that of the slabs, namely, $1\frac{3}{4}$ inch, then the whole boiler would have presented a distribution of material which for the weight employed will give the maximum resistance to internal pressure. In fact it may be confidently said, that the arrangement of small tubes in conjunction with shallow hollow slabs as designed by Prosser, is unapproachable by any other possible distribution of the material for the resistance of internal pressure in cases where a number of tubes is required; and in this respect it is worthy of praise and admiration, and may prove of great utility in the experimental solution of many problems in natural philosophy. The weakest part of the boiler, then, is the deep hollow cylinder containing the steam-room; its weakness lies in its sides and is caused by its depth, for although its two ends are flat surfaces, yet as they are closely braced across by tubes, they present a resistance to bursting pressure equal to that of the tubes themselves. What is the measure of the strength of this hollow cylinder? Is it *ceteris paribus*, in the direct ratio of the diameter? It would be so were it of indefinite length, but as its length is only 26 inches, and as it has solid ends braced rigidly apart at close intervals by stiff tubes so as to be incapable of receding from, or approaching each other, without first tearing asunder or crushing them, this ratio will be modified, and possibly to a very considerable extent, in favour of strength.

This paper is followed by one devoted to an account of an experiment made to determine the economic evaporation of a patent boiler by Messrs. Ellis, then in operation at Willard's Hotel, Washington. The remaining papers are similar records of experiments on the boilers of the U. S. screw frigates *San Jacinto*, *Niagara*, and steamship *Massachusetts*, The volume is altogether one which is replete with interest to the engineer.

CORRESPONDENCE.

THE ROTATION OF BODIES ON THEIR AXES.

Mr. Mitford, it now appears, gives up the moon to her own devices; be—neither assenting nor denying her axial motion—being determined henceforth to confine his attention to bodies within our reach, or at least not to venture higher than balloons can go. Before settling himself down thereto, however, he thinks it necessary to deny "the assertion" that bodies launched into space naturally take axial rotation. He appears to think that I have made such assertion, having, I suppose, read my observations, like witches prayers, backwards. As regards the moon, I averred that *now possessing axial motion*, by which she slowly turns each face in succession, towards the different sides of the starry heavens, such axial motion would continue unaltered, even were she to be wholly released from the attraction of the sun and the earth, and, consequently, losing her orbital motion, to take a straight path through space.

I also said (as by experiment I have often proved), that a body, to which a motion like that of the moon round the earth is given artificially, upon being suddenly lifted from the moving apparatus (pulled up by a string), will exhibit the axial motion that it has acquired from the machine, by spinning round in the air at the end of the string. Mr. Mitford says this spinning must be caused by the untwisting of the string. To this I answer, turn the machine the opposite way, so that the twisting of the string shall resist the spinning of the body (when lifted off the machine) instead of aiding it. If he try this experiment fairly, he will find that whether the twist of the string aid or obstruct the axial motion of the body, it will not fail to show itself unmistakably; and that, moreover, the direction in which it spins round, will in all cases be identical with that in which the machine was turning at the moment the body was lifted from it.

Mr. Mitford repeats his denial of Sir John Herschel's proposition in these words:—"But I do assert that a man in walking round a staff, a table, or other object, keeping his face to the centre of that object, does *not* rotate upon his own axis."

To this I answer, try it. Virtually prolong the man's vertical axis upwards, by fastening the lower end of a piece of tape to the centre of the crown of his hat—the upper end being attached to the ceiling right over the staff or table. Next, (the tape being free from twist) let the man walk once, twice, or thrice, round the staff or table, keeping his face towards its centre as prescribed; and observe whether or not the tape receive one, two, or three twists. Let the man then retrace his steps, by walking round the staff or table, once, twice, or thrice, in the opposite direction, and observe whether he untwists the tape thereby.

To complete the experiment, take the staff or table away, and put the man into its place. Let him then turn on his own axis once, twice, or thrice, first in one direction and then in the other; and observe whether the effect, in twisting and untwisting the tape, is not precisely the same as when the man walked round the staff or table.

This seems to me an "experimentum crucis."

If Mr. Mitford be still unconvinced, I would recommend him to approach the question from the opposite side; *i.e.*, let him by suitable means *deprive the man for the time of the power of turning on his own axis*, and then try whether, whilst so deprived, he retains the power of walking round a staff or table, keeping his face towards the centre. For if he can do this, whilst absolutely prevented from turning on his own axis, it is clear that I must give up the argument.

Let the man put on a tight-fitting hat or helmet that will keep its place firmly upon his head, and in place of the tape, connect such hat or helmet with the ceiling by an inflexible rod, attached to both in such a manner as, whilst allowing the wearer of the helmet to walk round the staff or table, it shall wholly prevent the rod and the helmet and the man's head, one and all, from turning on their axes; so that if the man begin by facing the north, he must needs continue to face the north throughout the process of walking round the staff or table.

Now, it is clear that the man, debarred from turning on his own axis, and constrained to keep his face wholly towards one point of the compass, could no longer turn his face constantly towards the centre of the staff whilst walking round it. Thus proving Sir John Herschel's proposition, by showing that the power of turning round upon his own axis, is essential to the man's walking round the staff in the manner prescribed in the experiment.

Mr. Mitford referred to the sun and planet wheels; (placed horizontally), the sun wheel having four times as many teeth as the planet wheel, and being a fixture for the planet wheel to swing round. He said in substance, that in swinging once round the sun wheel, the planet wheel would make *four* turns on its axis. I rejoined that it would make *five* turns. In proof, I proposed to tie a piece of tape from the axle of the planet wheel to the ceiling above, and to observe whether such tape received four twists or five. Mr. Mitford admits the five twists, but sets one of them down to some (incomprehensible) action of the frame of the machine. I presume he means the *arm* of the machine, the frame being a fixture. But the tape, being attached not to the arm of the machine, but to the spindle of the planet wheel, it obviously cannot receive a twist otherwise than by the turning round of that spindle.

Mr. Mitford quarrels with the attachment of the tape to the ceiling; saying (why or wherefore he explaineth not), that "an indicator to show the motion of a machine, must be wholly fixed to that machine, and not to any external object."

However, to fall in with his views, let us discard the tape and employ the mariner's compass instead. Let the planet wheel be supported entirely underneath, so as to present a flat surface at the top, and let the compass box be laid concentrically upon it. Swing the planet wheel round the sun wheel, and observe how many times the compass card revolves in comparison with the needle, which will steadily point northward throughout. If the compass card revolves but four times, I must acknowledge myself in error. But I doubt not that it will be found to revolve five times.

The mariner's compass might also be substituted for the tape in the case of the man walking round the staff, the compass box being fixed upon the crown of the man's hat, which should be placed horizontally; the observer standing upon something high enough to enable him to see distinctly both the needle and the card below it. He would then, as the man walked round the staff, see each of the thirty-two points upon the card brought in succession under the needle point.

Again, the experimenter standing upright, may take the compass upon the palm of his own hand, held out at a short distance from his body, and watching the card, make one turn upon his own axis. The compass box, in such ease, will move round the experimenter, keeping one side always towards him, as the moon moves round the earth. But it will inevitably present to the needle in succession, each of its thirty two points; and since it is not the needle that turns round, it must needs be the box. Perhaps Mr. Mitford will deny that either turns round; but if a compass box can, without turning upon its axis, really present in succession each of its thirty-two points to the needle, whilst that needle maintains its direction unchanged, the phrase, "turning upon its axis," must have a meaning, which, up to this time, I have not discovered.

I will conclude by describing an experimental apparatus, which exhibits the axial motion in question in a manner that, I think, must convince the most incredulous.

A, is a stand which has a fixed upright pin in its centre. B, is a T socket piece, (in section, ╤╒), it is slid down upon the pin, and turns freely upon it; C, is a forked arm; its stem has a small eye pin at D, and its cylindrical end passes through the horizontal part of the socket piece, and turns freely in it.

Fig. 1 shows the fork placed so as to hold the axis of M in a vertical position. Fig. 2 shows the fork turned round one quarter of a turn so as to bring the axis of M into a horizontal position. M, is a heavy sphere to represent the moon, and should have one face painted white; it is hung within the fork of C, so as to turn freely upon its axis.

To give the necessary motions, a piece of string should be tied to the

Fig. 1.

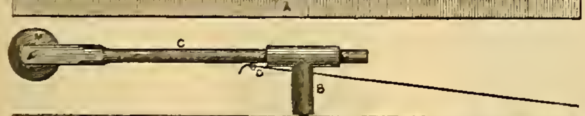


Fig. 2.

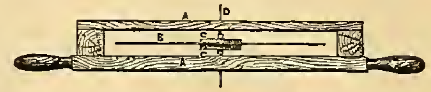
eye-pin, D, and then coiled some ten or twelve times round the upright stem of the socket piece, B.

The axis of M being made vertical, and its white face being turned towards the central pin in A, the string should be pulled gently at first, but gradually harder and harder so as to produce a gradually acquired rapid revolution of the arm, C, *with the continuance of the direction of the white face of M towards the centre.**

* If M be nicely hung, some little practice will be necessary to enable the experimenter to accomplish this; or some little additional device, as that of putting a piece of doubled paper very lightly between the ball, M, and the fork.

By continuing a tight pull upon the string somewhat after the coils have run off, the arm, C, will be brought to a stand, and the pull of the loop upon the eye-pin, D, will give the fork a quarter turn, bringing the axis of M into a horizontal position; in which position it will exhibit a rapid axial motion, acquired whilst its axis, placed vertically, was swinging round, as the moon swings round the earth.

Fig. 3.



And if, by coiling the string oppositely, the apparatus be turned in the opposite direction, the continuing axial motion of M will be seen to be in the opposite direction likewise.

A like result may be obtained by an apparatus of still simpler construction.

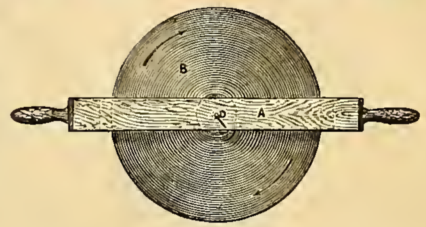


Fig. 4.

A A, figs. 3 and 4, represent a light wooden frame or sheave, with two handles. B, a nicely balanced disc made of tin plate, or other suitable material; its spindle a bit of stiff wire centred at each end, and for support driven through the wooden cheeks, C C. Two strong needles, D D, form the pivots for the disc to turn upon.

In making the following experiments, certain appearances will strike the observer as being very curious, although they are quite consistent with the theory, and indeed required by it.

The experimenter, standing upright and holding the frame by its handles horizontally before him, must be prepared to make a sharp half turn, or more, on his own axis, in each of the following experiments, viz.:—

1stly, By so turning himself with the disc, standing vertically, the experimenter will find that he does not give axial motion to the disc.

2ndly, The position of the disc being altered to the horizontal, it will *appear* to turn on its axis, so long as the experimenter himself turns, and to stop when he stops; being, however, in reality at rest, axially, all the time.

3dly, With the disc still in the horizontal position, but with its edge slightly pressed by the thumb, the disc will appear not to turn on its axis, as the experimenter turns on his. But if, whilst moving swiftly himself, he remove his thumb from touching the disc, then upon his stopping, he will find that the disc has a rapid motion on its axis, which it must have acquired, whilst it appeared to be axially at rest.

4thly, If proceeding, as in the last experiment, the experimenter upon removing his thumb, instantly turns the frame so as to bring the disc to a vertical position, the disc will exhibit rapid and continuous axial motion in that position.

5thly, If, with the disc still in the horizontal position, the experimenter set it in motion upon its axis before he himself moves, then, by turning upon his own axis *at the same rate that the disc turns*, he will appear, whilst turning in one direction, to stop the axial motion of the disc altogether; and by turning in the opposite direction he will appear to double it. But in either ease, upon ceasing to move himself, he will find the disc continuing its motion undisturbedly, thereby showing that the stoppage of its motion in the one ease, and the doubling of it in the other, were merely apparent and not real.

E. Hill.

London, May, 1860.

PRINCIPLE OF LOCOMOTIVE TRACTION.

All the designs of nature are perfect, and the principles employed as well as their modes of application are in every case those best suited to economical and efficient result. The tractive power of quadrupeds far surpasses, in a general sense, in efficiency and reliability the mechanical productions of man; simply because the principles of animal traction are those most suited to general efficiency, and they have never yet been embodied in a locomotive engine. These principles, however, are capable of exact definition, and their efficiency, economy, and reliability, are capable of a more complete development, through the agency of artificial means, than in the production of nature; because the muscular power of the animal is subject to fatigue and exhaustion, while that of the locomotive is not.

The principle of animal traction lies in keeping the centre of gravity of the body in suspension, at a point obliquely to that at which the foot rests on the earth, gravity being an active agent, and not as in the locomotive, passive, expressing its use through the friction which it gives. In the quadruped, friction and muscular power are subservient to the development of the tractive power due to gravity; in the locomotive engine (as at present constructed) gravity and power are subservient to develop that due to friction. The muscular power of the horse is expressed obliquely in a direct line between the resting point of the foot and the centre of gravity of the body, while the tractive result

Fig. 1.

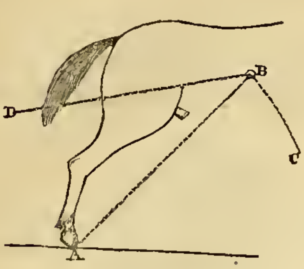
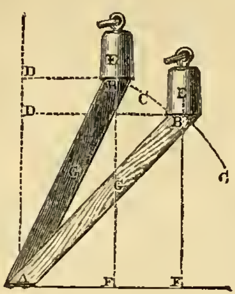


Fig. 2.



is directly due to the gravitating action of the body resisting this effort. The power of a locomotive is expressed horizontally between that part of the wheel in contact with the earth and the load to be drawn, and the tractive result is due to friction. The three agents in animal tractive power are friction, power, and gravity; and they exist in about the same ratio or proportion in the quadruped, and the locomotive of the present day; it is only necessary, therefore, that they should be subjected to a similar process of development, in order to render the latter as efficient an agent of general locomotive traction as the former. The following figures illustrate the principles of animal traction, and the simple modes of their application in a steam engine:—

Fig. 3.

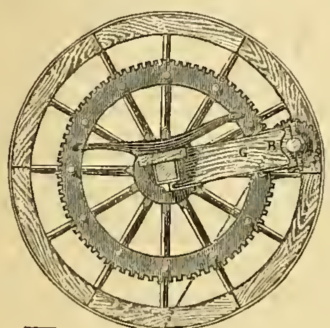
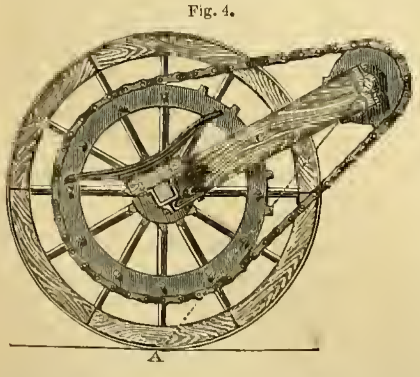


Fig. 1 represents the hind quarters of a horse in a drawing position, the muscular power being exerted between the points, A and B, and tending to raise the weight of the body; the law of gravity acting in opposition to this force takes the course, C, and the result is a tractive effort in the line, D. The value of this traction bears the same proportion to the weight in suspension at C, as in fig. 2 the line, D, does to E.

Fig. 2 represents two levers, G, at different angles of inclination, each supporting a weight of 100 lbs., which, in its tendency to descend in the line, e, expresses a horizontal traction force, D, proportionate to the inclination of the lever. This proves the existence of a principle, which, without fully employing all the adhesion due to friction, yields a tractive force nearly equal to the weight of the instrument which develops it.

Fig. 4.



Figs. 3 and 4. The resting point of the lever (in fig. 2) is represented by the roughed tire of the wheel, which is ever renewed by rotation, while, by liberating the axle of the wheel from rigid fixture, and transferring the weight of the engine to a point between it and the circumference, the relative positions of the weight at B, and the foot at A, is constantly maintained.

In both cases, when the engine is at rest, the weight is sustained by the string on the axle; when set in motion the weight is transferred to the point, B; this is effected by placing a lever, G, between the spindle of the dividing pinion and the axle of the dividing wheel, and liberating the latter from all other rigid confinement.

John Giles.

London, May, 1860.

MITFORD'S TRACTION TIRE.

As it appears from several of your late numbers, that the road locomotive is again calling forth the attention of mechanics, and as I find that the traction engine maker is approaching nearer to an idea I have had for many years, that it is necessary to employ some means to obtain a holding power on the road, I send you the following remarks on the subject, not being in a position to carry them out myself, if you think them worthy a place in your *Journal*.

The self-laying road,—or what I think would be a more appropriate term, the snow shoe system—although ingenious, can never be of real practical use on common roads, on account of the wear and tear of so many joints, and the constant chance of breakage, on account of strains, caused by stones, and other matters getting between the portable way.

A system of *traction tires* must ultimately be the result of all these first attempts, and if the Road Trusts have any desire to bring part of their traffic back to its old channel, they must assist, and not put impediments in the way of those who are willing and ready to make the first sacrifice of money, labour, and ingenuity. On the contrary, if it is their wish to bring road locomotives into general use, let them offer a premium for the best carriage, besides giving the advantage of running toll free for a certain time, we may then expect to see a result (not equal to that at the competition for locomotive pre-eminence) but equally advantageous in a mechanical point of view, that is, that a carriage might be produced, not only outwitting the most sanguine expectations of the maker, but also casting into the shade the elaborate calculations of the theoretically learned.

The drum traction engine of T. and R. Blackburn, is a move in the right direction, except that the width of the drum, and the projections on its circumference being at right angles to the tractive force, both interfere with its working power,—1st, the width of the drum will evidently cover a large space on the road, and therefore must pass over many obstacles which a narrower wheel would avoid, and often such as the front wheels might pass, but for want of room the drum would be obliged to go over; 2d, the ribs or projections being at right angles to the tractive power, every obstacle will meet it in the most obstructive position, without the least chance of any matter being avoided, so that a lift or jolt must take place over every thing that will not crush or sink into the road, and as these lifts or jolts would be sometimes in the middle, or at either end, it would cause a great irregularity in the motion of all the working parts.

Road Trusts ought to bear in mind, when they talk of damage to the roads by mechanical tractive power, in place of the natural, that the almost extinct four-horse coaches drawing little weight were continually beating the road to pieces by the action of sixteen levers worked at a four-horse power. Now I have little doubt, if an engine came upon the road, acting upon the lever principle, there would be no end to the hue and cry about the damage done.

Tractive power cannot be obtained without wear and tear of the road; railway companies are now aware of the fact, and we no longer hear the old opinion so fondly anticipated by the promoters of railway companies, that iron road were never to wear out.

My opinion is, that a wheel tire, with the surface formed as shown at fig. 1, would realize more tractive power than most men would at first sight imagine, the point of the wedge or spreading form of the projections being in the centre of the width of the wheel, would have the tendency to push any small obstacle to one side, and cause it to enter the hollow

Fig. 1.

Fig. 2.

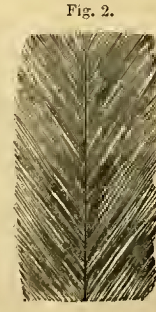
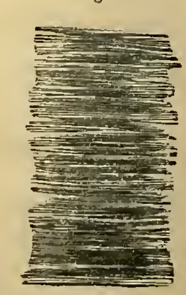


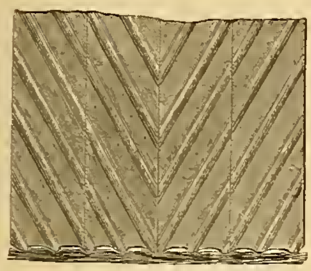
Fig. 3.



part between the projections, where it would be retained till left behind. With such a wheel, the road would be left in the form represented in fig. 2, whereas the drum wheel would leave the road as shown in fig. 3; now, it is evident, the lines in fig. 2 will be more easily and more smoothly gone over than the lines represented by fig. 3, giving much less obstruction to the tractive power in comparison to fig. 3.

Again I conceive, there would be in such a wheel, a kind of lifting power, in favour of the tractive force, in the rolling action of such a tire, such as we see in the curious experiment of the cone up the incline, whereas on the drum principle, everything encountered would impede the tractive force, backing or turning would also be more easily performed; I might lengthen this letter, but I imagine there can be but one opinion on the subject of advantage.

Fig. 4.



In conclusion, such tires would have the advantage of being rolled, and therefore less expensive: say, for moderate weight or passenger conveyance, a tire of six or nine inches might be rolled; two of these put together, as in fig. 4, reversed would make a wheel of one foot or eighteen inches. If found advantageous to make a wider wheel, (supposing such iron could not be rolled wider than 9 inches,) a number of these tires may be so arranged as to produce a wheel as wide as necessary by the plan, shown in fig. 4.

BERTRAM MITFORD.

Cheltenham, May 10th, 1860.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

FRENCH ACADEMY OF SCIENCES.

At the last sitting a commission was appointed, composed of MM. Velpeau, Rayer, J. Cloquet, Andral, and Cl. Bernard, for the purpose of awarding the Barbier prize. This will be the first time of its being adjudged; and as it is intended as a reward for any great discovery in surgery, medicine, pharmacy, or medical botany, there will be several candidates in the field; and as in the course of a few months only, hypnotism, coal tar plaster, the regeneration of bone, the cure of lockjaw, and santonine applied to amaurosis, have been in the field, the conflict will be a severe one.

M. Boutigny, in a note, endeavoured to show that the expression commonly used of the spheroidal state of liquids was erroneous, and calculated to give a false idea of the molecular state of matter. He observes that it is by no means necessary that a body should be in a liquid state in order to assume the spheroidal one; and that he has made chloride and nitrate of ammonia, the bichloride of mercury, camphor, iodine, stearic acid, wax, tallow, &c., pass directly from the molecular to the spheroidal state. He more especially calls the attention of the Academy to a curious fact in corroboration of his theory—viz., that if small pieces of ice, of the weight of a few grammes only, be operated upon, and they be thrown on the back of the hand, partly in a liquid and partly in a solid state, two different sensations will be felt in a very short time; first, a strong heat (98 deg. centigr., 208 Fahr.), and afterwards an equally strong sensation of cold (freezing point).

M. Pron. sent in a paper on the possibility of suppressing switchmen on railways by introducing a self acting lever, by means of which the engine-driver himself may have the switches under his command.

The Academy received a paper from a competitor for the Bréant legacy. He is a physician in the island of Java, but has concealed his name under a sealed cover. His remedy for cholera, and which he states to have always succeeded, is liquid ammonia in sugar and water, aromatized by a few drops of essence of peppermint.

PHILOSOPHICAL SOCIETY OF GLASGOW.

FEBRUARY 1, 1860.

"Observations on sensations experienced while climbing the more elevated mountains of the Andes in Peru and Bolivia," by Mathie Hamilton, M.D.

"Observations on the supply of coal and ironstone, from the mineral fields of the West of Scotland," by Mr. William Moore, C.E.

MARCH 7.

"On the incrustation of marine boilers," by Mr. W. Wallace.

"On electrical discharges in rarified media," by Mr. W. Wallace.

MARCH 21.

"On Trap Dykes between Cordon and the South End of Whiting Bay, Island of Arran," by Mr. James Napier.

Mr. George Blair afterwards described and experimentally illustrated some new apparatus for measuring, weighing, and regulating the force of the voltaic current.

APRIL 4.

"Historical notes of copper smelting," by Dr. F. H. Thomson.

APRIL 18.

"On a new process of ornamenting glass," by Mr. James Napier.

Professor Allen Thomson exhibited, with microscopes, a series of preparations illustrative of the minute structure of the spinal cord and nerves, and gave a description of these preparations, together with remarks upon the subject which they illustrated, from his own observations and from those of Dr. Thomas Reid, by whom a large series of very beautiful microscopic preparations of the nerve-structures had been made.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

APRIL 3, 1860.

"A memoir of the late John Kennedy, Esq.," by the President.

"On the efflux of air," by Dr. J. P. Joule. The author, after referring to the experiments and views of Newton, Bernoulli, Venturi, Savart, and others, on the flow of liquids and elastic fluids, described some experiments he had recently made on the flow of air through orifices in thin plates, and through tubes. The pressures employed were from 5·6 inches to 1·44 inches of water. The quantity of air discharged was found to observe the well-known law of the square root of the pressure. The author's experiments on the velocity of air discharged through orifices of different forms were made with a pressure of 1·44 inches. For very small pressures $V=\sqrt{2gh}$; calling this unity the velocity through holes in thin plates, is 0·607; through pipes of diameter equal to their length, 0 767; and through pipes of diameter equal to their length, furnished with a piece of wider tube for the entrance of the air, 0·893.

"Contributions to medical meteorology," by Messrs. Ransome and Vernon.

PHYSICAL AND MATHEMATICAL SECTION.

MARCH 29, 1860.

"Remarks on the theory of rain," by Mr. Baxendell.

"On the history of invention as applied to the dyeing and printing of fabrics. Part 1st, Chemistry." By J. Graham, Esq.

"On a compound compensated pendulum of steel and zinc," by Mr. Lowe.

"Observations of the zodiacal light," by Mr. Baxendell.

INSTITUTION OF CIVIL ENGINEERS.

APRIL 24, 1860.

"Account of the works recently constructed upon the river Severn, at the upper Lode near Tewkesbury," by Mr. E. L. Williams, M.I.C.E.

MAY 1, 1860.

"On coal burning and feed-water heating in locomotive engines," by Mr. D. K. Clark.

MAY 8, 1860.

"On Indian railways, with a description of the Great Indian Peninsula Railway," by Mr. J. J. Berkely.

GEOLOGISTS' ASSOCIATION.

MAY 7, 1860.

The Rev. Thomas Wiltshire, M.A., F.G.S., president in the chair.

A paper "On the action of heat on certain sandstones of Yorkshire," by Charles Tomlinson, Esq., was read.

MONTHLY NOTES.

MARINE MEMORANDA.

The select committe appointed to inquire into the manufacture of anchors and chain cables for the merchant service, and who were empowered to report their observations, together with the minutes of the evidence taken before them, have considered the matters to them referred, and agreed to the following report:—"1. That at the outset of this inquiry it was established in evidence that the loss of chain cables by parting, and of anchors by breaking is of rare occurrence in Her Majesty's navy; and that this appears to arise from their having been subjected to a sufficient test before they are received from the contractors, and also from their being thoroughly examined, and in many cases retested, when returned into store or before they are again issued for service. 2. That a variety of witnesses, chain-makers, ship-owners, engineers, and persons conversant with shipping, examined before the committee, concur in the opinion that it is highly expedient that chain cables and anchors for the merchant service should be subjected to an adequate test before they are used, as it would be the means of saving much life and property. 3. That a considerable portion of cables now made for the merchant service are of inferior iron and defective workmanship. 4. That the corporation of Liverpool and Harbour Trust of that port have for many years employed a testing machine of limited power, which is kept in full employment; and that since this inquiry was ordered by the House of Commons, it appears that the Harbour Trust, to meet the demands of that port, have decided on the erection of machines of greater capacity and power. That it is also in evidence that, during a period of five years, of cables sent to the Liverpool testing machine, $82\frac{1}{2}$ per cent. are imperfect cables. 5. That in Sunderland two testing machines have been for some time in operation, which, although private property, are accessible to all, and that the superior character of chain cables made in that district is in a great measure due to the results of these testing machines. 6. That, from the evidence of all the witnesses examined, your committee has formed the opinion that nothing but the use of proper testing machines can afford any guarantee for the soundness of cables or anchors, as defects may exist, either from badness of material or imperfect welding, which no inspection can detect; and so closely can the tenacious quality of iron be calculated, that chains may be made to bear a given strain, which would break if the least excess of it were applied. 7. That though instances have been adduced by some witnesses to support the opinion that the application of a severe strain in testing has an injurious effect on a cable, this idea seems to the committee to be completely refuted by the evidence of Mr. Willcocks, and by the results of experiments made at Woolwich, and referred

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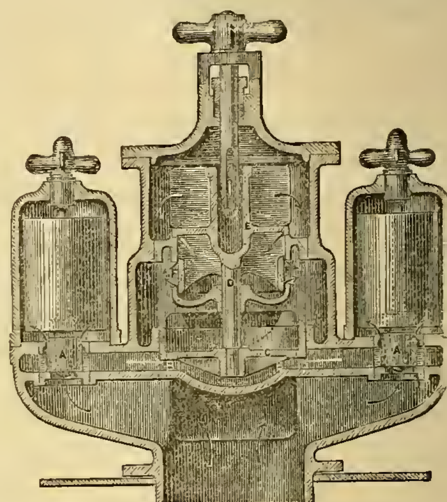
to in his evidence. 8. That all the witnesses examined agree in the utility of a test, and some of them, including all the manufacturers of chain cables examined, desire that its use should be compulsory, as many cables are now sold with false certificates. 9. That good grounds having been established in this inquiry for recommending the adoption of public tests, the only questions which remain are, the authorities into whose hands this duty should be confided, and the regulations that should be enforced. 10. That your committee are of opinion that bodies enjoying the confidence of the mercantile and shipping interest, and whose local residence will ensure an adequate superintendence (such as dock trustees), are the proper persons to undertake this duty; and that the regulations under which they act should be approved by the Board of Trade. 11. That in order to suit the convenience of manufacturers of chains and anchors who have testing machines on their own premises, the Board of Trade, on receiving a requisition from any such manufacturer, should appoint inspectors to attend the testing of any chains or anchors, and give certificates, according to printed regulations to be framed for that purpose, of the strain applied to them, which should be the test applicable to their size. 12. That although the committee cannot overrate the advantage of having the chains of every vessel subjected to a test, they are unwilling to recommend that the test should be made compulsory; but, as they have recommended the general use of testing machines, they consider that all ships launched after the 1st of January, 1861, which come under the provisions of the Passenger Act, or are employed by any department of Her Majesty's Government, either in the conveyance of emigrants or troops, should be required to produce certificates that their cables have been properly tested."

Our eastern ports appear to progress in trade in a most favourable manner. The increase in the trade of Hull during the last five years, as appears from evidence given before a select committee of the House of Commons, has been 50 per cent., the tonnage in 1855 having been 1,085,000 tons; while in 1859 it was 1,500,000 tons. The increase in the population since 1850 is estimated at 20,000. The tonnage of Goole was 244,264 tons in 1855, and 269,815 tons in 1859—showing an increase of about 10 per cent. At Grimsby the tonnage was 92,658 tons in 1855, and 337,582 tons in 1859 showing an increase of no less than 264 per cent. For several years past endeavours have been made to obtain a transference of the New Brighton, Egremont, and Seacombe Ferries from the private owners, Messrs. Coulborn Brothers, to the Wallasey Board of Commissioners, and this has been at length achieved under an award of arbitration. The fact was officially announced at the monthly meeting of the Board on Thursday evening, as having taken place in London on the 23d ult. The demand made on the part of Messrs. Coulborn was £160,000, and the offer of the Commissioners was £34,000. After a protracted hearing of witnesses and counsel on both sides, the award was made for the transfer at £60,000. At the meeting the proceedings were confirmed, and the Ferry Committee of the Board obtained leave to advertise for a general manager at an annual salary of £350, and for plans or models for the best forms of ferry steamers. This last authority is much needed. The ferries in question are between Liverpool and the different points above named, on the Cheshire side of the Mersey, and they are very important, as may in some measure be judged from the sum at which they have been transferred. Notwithstanding the importance of these ferries, the steamers for conducting them have been, and still are, of the most antiquated and imperfect character, so much so indeed, that they have for a long period been considered dangerous. It is to be hoped, that now under this change of affairs, the authorities will visit the Clyde, and get some hints from the beautiful steamers at work there.

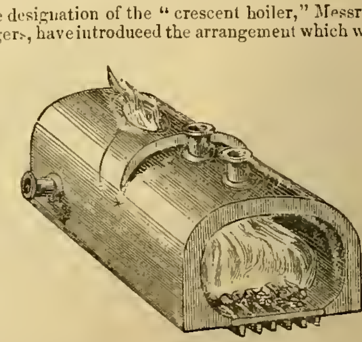
Mr. William Pile, of the North Sands building yard, on the Wear, has just completed a fine East Indiaman, called the *Malabar*. She has been purchased by Mr. Richard Green, the London shipowner and shipbuilder. Her dimensions are:—Extreme length, 230 ft.; for measurement, 210 ft.; breadth, 37 ft.; depth, 22ft. She is classed for 13 years, and will carry a burthen of over 2,000 tons. Her timbers are all oak, her planks teak, and she is extremely well fastened for a 13-years' ship. A recent rule of Lloyd's requires that all ships whose length is five times their breadth shall be fastened with diagonal iron plates over their timbers, but under the skin of the vessel, for the purpose of giving additional strength to the ship. This is fully carried out in the *Malabar*, and, although the regulation has only been in operation six month under Lloyd's compulsory rules, it is no new thing, having been adopted some years ago in most of the ships built for Mr. Green. She has been fitted with a poop 90 ft. in length, and topgallant forecastle, and being intended principally as a troop and passenger ship, great care has been taken to have her 'tween decks lofty and commodious. They are 7 ft. high, and great attention has been paid to the ventilation. When viewed from a distance, previous to the launch, her great length and beautiful model attracted great attention. Her prow is adorned with a splendidly carved figurehead of a Malabar chief, 11 ft. in height, in a riding position (the old man-of-war style) with shield and scimitar. On the shield is the name of the vessel, "*Malabar*." The carving of this figure is by Mr. James Lindsay. Her total cost will be about £30 000. She will be fitted out in Sunderland, and will proceed to the Thames to be coppered.

When the season opens, several new iron steamers for inland navigation will be sent out from the Tyne to Russia. Amongst these is an iron paddle-wheel steamer built by Messrs. C. Mitchell and Co., of Low Walker, on the Tyne, which is fitting out for Russia, intended for the navigation of the river Volga. The *Moujie* is 150 feet long, and when in active service will only draw $2\frac{1}{2}$ feet water. She is being fitted with passenger accomodation in a style peculiar to Russia, and will comfortably carry from 200 to 300 persons. In consequence of their being continuous water communication from the Baltic Sea to the river Volga and the Caspian Sea in the very centre of the Russian empire, steamers built in England are transported in their complete state from the premises of the builder here to the interior of Russia. The only difficulty in the way of such transport is the having to pass through the locks of a canal in many cases not half the length of the vessel. This apparently insurmountable difficulty is overcome by constructing the vessels in two or three sections, each water tight in itself, and in length suited to the shortest lock to be traversed. The employment of iron as a shipbuilding material presents so many structural facilities that this formation in distinct sections is accomplished without the slightest sacrifice of strength, and the sections may be separated or united in a few hours. The *Moujie* is provided with machinery manufactured by Messrs. R. Stephenson and Co., embracing many of the recent improvements for effecting economy of fuel. Messrs. Mitchell and Co., are completing two other similar steamers, which, with the *Moujie*, will be despatched to Russia on the opening of the navigation.

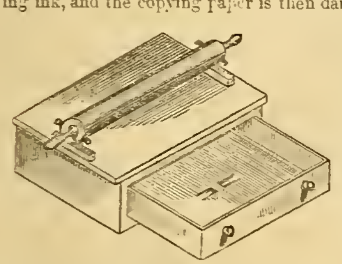
Compound Safety Valves.—The subjoined illustration is a vertical sectional elevation of one modification of a safety valve, invented and patented by Mr. J. H. Bennet, of Leith, engineer. The small valves, A (one or more may be used), are loaded directly by weights, in locked chambers, or otherwise, and so constructed as to open freely to their full area, admitting the escaping steam to the circular chamber, B, in which the disc, C, is suspended by the spindle, D, to the large valve, E, opening inwards to the boiler or steam chest. The steam escapes by a small space all round the disc, and when the area of this vent is exceeded by that through the small valves, the pressure in the chamber below the disc becomes equal to the pressure in the boiler: the area of the disc being in excess of the internal surface of the large valve, it is then forced upwards, thus opening the valve to any required extent. The large valve is formed with three feathers on the lower side, on which is cast a ring, covering the escape-passages, F, when the valve is closed, and causing it to fall gently to its bearing, but this ring is not in contact with the sides of the chamber in which it is placed, a small steam space intervening. The steam may be supplied to the small valves by the same pipe as to the large valve, or the former may be in separate chests with distinct pipes to the boiler. The advantages of these compound safety valves are—the material reduction of dead weight in proportion to the effective area of escape, the small valves only being loaded, and the greater safety secured thereby, the large valve being dependent on, and nearly simultaneous in its action with, either of the small valves, and these being constructed with the utmost regard to efficiency in every respect. The convenience to surveyors and engineers of having the loaded valves of uniform dimensions, as they may be invariably of five or ten square inches area, is evident, while the large valve, being of any size, secures a free escape of steam to any amount desired. The large valve, also opening inwards, is free to admit the atmospheric air to the boiler, thus obviating any danger arising from causes tending to produce collapse It may be added, that, no surfaces being in contact, except the bearing faces of the valves, which are single, they are free from the objections as to unequal expansion and other defects, to which all forms of double-beat valves are more or less liable.



Crescent Boiler.—Under the designation of the "crescent boiler," Messrs. Garton & Jarvis, Exeter, ironmongers, have introduced the arrangement which we here engrave. These boilers are adapted for heating large ranges of hot houses, pine and melon pits, as well as public and private dwellings. The fire acts on both the inner and outer surfaces, and from the fact of its forming nearly three-fourths of an oval, (the fire bars occupying the place of the other fourth,) the fuel in a state of combustion rests on the sides of the boiler, and the heat is attracted to the crown by the flue hole, whence it is made to descend and traverse the outer surface by means of a "whiff." These may be termed the "boilers of the day," as they are very powerful and economical in fuel as well as price, and are made in various sizes capable of heating from 300 to 1500 feet of 4 inch pipe, or larger if required.

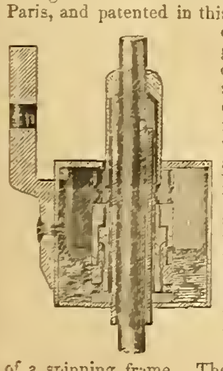


Copying Documents.—A neat and very compact apparatus for copying letters, invoices, and other writings, has been introduced by Mr. J. H. Gresham, of Kingston-upon-Hull. The illustrative figure represents a copying case or stand fitted with roller and appurtenances, the drawer containing a water tank for damping the paper, which tank is covered with a lid, so that the papers and oiled sheets may also be contained in the same drawer. The body of the roller which may be made either SOLID or *hollow*, may be composed of metal, wood, or any other suitable material, but the patentee prefers to use wood for general business purposes; its diameter may be about 2 inches, and its length suited to the size of the sheets of writing to be copied. This roller is carried loosely upon a central rod or spindle, so as to be capable of turning freely thereon, when pressed over the papers to be copied. The two handles are screwed one on to each end of the rod or spindle, which is turned smooth so as to work freely in the two end metal washers secured to the ends of the roller. By another arrangement the roller and spindle may be fastened together or made in one piece, in which case, the handle should be left free to turn loosely round the two ends of the spindle. The writing to be copied is written in any suitable copying ink, and the copying paper is then damped with water, and the letter placed in juxta position to it as in the case of ordinary press copying, and the oiled sheets are employed for preventing the ink from spreading to other parts of the book or paper. The book or copying sheets being thus prepared, and the letter or other document deposited in its place thereon, the pressure is then applied by means of a roller, the ends of which are held in the hands of the operator. After this roller has been pressed once or twice over the copying paper, either in a book or separate sheets between the ordinary pads, the letters will be found to be perfectly copied.

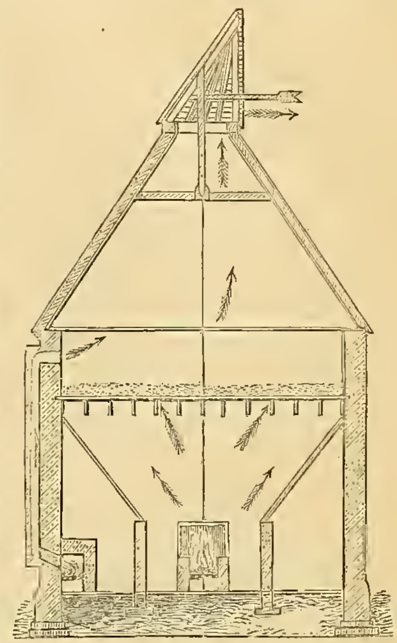


THE MANCHESTER ASSOCIATION FOR THE PREVENTION OF STEAM BOILER EXPLOSIONS.—At the usual monthly meeting of the Executive Committee, Mr. H. W. Harman, C.E., chief inspector, presented his report, from which the following are extracts:—We have made 181 visits, and examined 466 boilers, and 353 engines. Of these, 6 visits have been special; and 9 boilers have been specially, 429 externally, 11 internally, and 26 thoroughly examined, 13 cylinders have been indicated at ordinary visits. The principal defects met with during the month are as follows:—Fracture, 8 (two dangerous); corrosion, 20 (6 dangerous); safety valves out of order, 23; water gauges ditto, 11; pressure gauges ditto, 5; blow-off cocks ditto, 7; fusible plugs ditto, 4; furnaces out of shape, 10; total, 88 (8 dangerous). Boilers without glass water gauges, 22; ditto pressure gauges, 3; ditto blow-off cocks, 17; ditto back pressure valves, 61. The remaining defects are of the ordinary character, such as leakages from bad joints, causing slight corrosion, unequal expansion and contraction, faulty modes of seating, and the injudicious delivery of feed water in a cold state, and at those parts of the boilers least calculated to receive it. I have, however, so often and so fully alluded to these subjects in former reports that to our members a repetition can be of little service. I may add, however, that so long as people are content with arrangements as they have been, and who will view with distrust every attempt at improvement, and every endeavour to dispel the antiquated notions of the past, so long will defects, both in boilers and their fitments, prevail to the detriment of the machinery itself, and at a pecuniary sacrifice to the owners. The late boiler explosions in the North of England, accompanied, I am sorry to add, by the loss of many lives, recall to mind the necessity that exists for such associations as ours, and the advantages in regard to safety that must ever ensue from a well-directed supervision of constructions of so dangerous a character. Indeed, we may say that the elements of disaster are always bottled up in them, ready to go forth on their fatal course when, either by mal-construction or neglect, they are not kept under proper control. In regard to the well working of this and similar institutions, various opinions will always exist as to the mode of carrying out their objects, but in my opinion, the success that has attended ours in particular in the prevention of accidents, fully entitles it to the support of all users of steam power, even of those whose private arrangements are of so complete a character, as to render them less dependent than others upon our operations.

LUBRICATING APPARATUS.—The accompanying engraving represents one arrangement of a lubricating apparatus, invented by M. Silvain Péchet, of Paris, and patented in this country by Mr. J. H. Johnson. The main feature of these improvements, which may be modified to a great extent, consists in the application and use of a double or single tube, fitted to and surrounding the shaft or spindle to be lubricated; the lower portion of the tube (which is perforated) rotating in an oil reservoir, and thereby constantly raising the oil up to the bearing by the combined efforts of capillary attraction, and the screwing motion imparted to it by the rotation of the lubricating tube. For footstep bearings, it is simply requisite to surround the footstep and lower portion of the spindle or shaft with a tube perforated laterally at the bottom, and contained within an oil reservoir which surrounds the bearing. A cap may be fitted to the lower end of the shaft or spindle when they assume an inclined position, for the purpose of preventing the oil from being carried up the shaft. The figure represents, in a vertical section, the application of the apparatus to a spindle of a spinning frame. The axis or spindle does not bear against its bush, but has fitted to it a tube of brass or other metal, which alone comes in contact with the fixed parts, and extends downwards to the bottom of the lubricating box. The box is fitted with a central tube, which is placed in the intervening space between the brass tube and the spindle. The bush consists of a piece of tube pierced with holes. The brass tube has, at its lower extremity, an annular projection on the upper side of the perforated tube. An outer tube is fixed by means of a bayonet coupling, or other suitable means, on the cylindrical part of the bush or perforated tube. This tube is for the purpose of upholding the shaft by means of a projection on the interior, which is placed just above the projection. The oil first lubricates the point of contact, then, by the rotatory movement, is raised between the concentric tubes, performing the same office for the other rubbing parts, and is returned back by the holes in the outer tube.



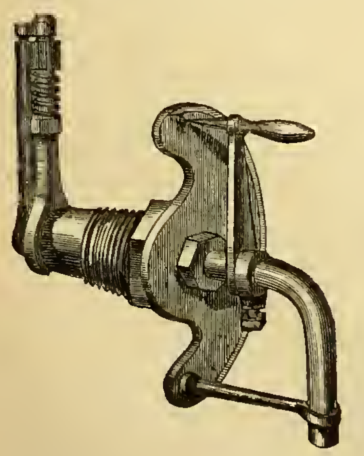
MALT DRYING HOUSE.—This arrangement of a house for drying malt, hops, and other vegetable produce, is the invention of Mr. J. C. Plomley, of Maidstone. Our illustrative figure represents a vertical section of the drying house. In addition to the usual fires in the centre of the house, one or more fires are placed behind the partition; the heated air from which passes up over the produce to be dried, which is placed on the floor of the drying chamber above. The improvement consists in introducing currents of heated air to pass over the surface of the produce to be dried, in addition to the ordinary method of passing heat through the produce. This carries off quickly the moisture arising from the ordinary drying fires, however quick or strong they may be, at the same time causes a partial vacuum in the drying chamber, by which rapid evaporation takes place even at a low temperature. The action is as follows:—The moisture arising from the produce to be dried by the action of the central fire, is immediately carried off by the current of heated air arising from the side fire passing up the flue and out at the cowl. It is immaterial whether the fire or flue is placed inside the external walls, the centre, or the outside; but it is essential that nothing should impede the current of air up the flue, and that it be directed to the cowl, or opening of the building. By this means, malt may be dried in a third less time than usual, and a paler and brighter sample obtained.



ROYAL NATIONAL LIFE-BOAT INSTITUTION.—The annual report of this institution has just been published. It begins by stating that the total number of life boats, including those in course of construction, belonging to the Institution, amounted to one hundred and one. A truly noble fleet. Out-numbered, to be sure, by the navies of commerce and of war, but the largest life-saving fleet that the world had yet seen. The life-boats of the Royal National Life-Boat Institution had, at various points of our coasts, been actively called into operation on sixty-one occasions during the past year. Two hundred and eighteen lives had been saved from thirty-nine wrecks, and five vessels had been assisted safely into port. For these valuable exertions the total sum paid to life-boats' crews was £733 18s. 9d. On these occasions, and on those of quarterly exercise, the life boats were manned by about 4,000 persons. Nearly all the services took place in stormy weather and heavy seas, and often in the dark hour of the night. The Committee lamented that the number of wrecks in the seas and on the coasts of the British Isles, and the consequent loss of life therefrom, had been unprecedentedly large during the past year; no less than 1,646 of our fellow-creatures having met with a watery grave. In the case of two wrecks alone—viz., those of the *Royal Charter* and the *Pomona*—upwards of 800 persons perished in the darkness of the night, without the possibility of any assistance reaching them. It was, however, consoling to find, that the exertions which had been made during the past year to rescue life from shipwreck had been attended with great and encouraging success, as was shown by the official return of the Board of Trade: 2,332 having been thus saved. The services of a life boat were usually only called into requisition when it would not be safe for any other kind of vessel to approach a wreck. The total number of persons saved from shipwreck since the first establishment of the National Life-Boat Institution, and for rescuing whom the Committee had granted honorary and pecuniary rewards, was 11,401. Language failed adequately to describe the amount of happiness which the saving of so many thousands of persons must have conferred. During the past year year 1 gold medal, 20 silver medals, 13 votes of thanks inscribed on vellum, and £1,108 15s. 3d. have been granted for saving the lives of 499 persons on the coasts and outlying banks of the United Kingdom. Many of these services had been of the most gallant and noble character. The gold medal had been presented to Joseph Rogers, the Maltese seaman of the *Royal Charter*, who with a line round him swam through the heavy surf to the rocky shore, when that unfortunate vessel was wrecked on the Anglesey coast in October last, which line was the means of saving many persons, and which, had not the vessel broken up in so short a time, would undoubtedly have been the means of saving most of those on board. The Committee acknowledged the assistance which they continued to receive from the Local Committees; from the Mercantile Marine Fund, through the Board of Trade; and from the Commodore Comptroller-General, the Deputy-Comptroller General, and the officers and men of the Coastguard service. The operations of the Committee may be thus briefly stated:—Since the formation of the Institution it has expended on life-boat establishments £36,948 5s. 8d., and has voted 82 gold and 658 silver medals for distinguished services in saving life, besides pecuniary awards, amounting together to £12,759 15s. 3d. During the past year expenses had been incurred on either additional new life-boat stations, or the replacing of old boats, transporting carriages, and houses, by new ones, repairs, stores, and alterations of boats, carriages, and houses, and for exercising the crews of life-boats, amounting altogether to £11,120 18s. 3d. This great and national work had however, only been accomplished by the Society incurring liabilities to the extent of a further sum of £3,834. The receipts of the Institution, from all sources, amounted last year to £11,652 11s. 6d. Amongst the interesting incidents connected therewith, the Committee gratefully acknowledge the accompanying gifts, specially appropriated at the request of the donors themselves to the cost of the following life-boats; Exmouth, (Lady Rolle,) £375; Porthcawle, Portrush, (M. A. C. S.,) £380; Kingsgate, St. Andrew's, Thurso, (A. W. Jaffray, Esq.,) £560; North Berwick, (Messrs. Jaffray and Son,) £180; Lizard, (the Hon. Mrs. Agar, and T. J. Agar Robartes, Esq., M.P.,) £269. 13s. 7d.; Fowey, (Wm. Rashleigh, Esq., and the Hon. Mrs. Rashleigh,) £100; Banff, (Messrs. Macfie and Sons,) £180; £150 was also received from the Shipwrecked Mariners' Society, chiefly collected in threepences from its seamen-members in aid of life-boats. During the preceding year legacies had been left to the Institution by the late Miss Church, £100; George Biggs, Esq., Strand, £100; Edwin Cuthbert, Esq., Denmark Hill, £50; and from Mrs. Ann Thompson, £100. The Report concluded by alluding to the fact, that not only was the National Life Boat Institution now one of the most important benevolent societies in our land, but that its operations were known to all the maritime powers of the world. Some of these governments had had life-boats built under the superintendence of the Institution, which had already been instrumental in saving many lives. Englishmen resident in distant parts of the globe had also often sent tokens of their approval of its philanthropic labours. The Committee made their present earnest appeal on its behalf, in the full assurance that those who would extend to it their support, would not only enhance a work of benevolence and mercy, but of national importance, and would thus aid in helping onward the best interests of the cause of humanity in our country.

American Boiler Water Gauge.—The instrument represented in perspective by the accompanying illustration, is designed for ascertaining the exact level of water in steam boilers. In it there is a right-angled tube of about half an inch diameter, with a bore of three-sixteenths of an inch. The arm of this tube, when at rest, stands perpendicularly within the boiler, and should be of such length that when its position is reversed it is capable of reaching the lowest level of water which the boiler may contain with safety. The other arm passes through a stuffing-box, within which it should be free to have a semi-rotative movement upon its axis—and a lever is attached to its outer end for the purpose of imparting to it the necessary motion. A thread cut upon the body of the instrument serves to make the necessary connection with the boiler.

The aperture at the upper end of the arm is covered by a conical valve, which is actuated by means of the lower end of a valve rod passing over a cam when the instrument is brought into operation. The lift given to the valve is rather less than an eighth of an inch, being quickly raised and held uniformly open during trial. A spiral spring is employed for the purpose of keeping the valve seated when not in use.



A dial is attached to the instrument, which, being graduated in inches, indicates by means of a pointer the height of water (above the lowest admissible level), which is contained within the boiler at the time of trial.

When it may be desired to ascertain the water level, the handle should be moved in the direction of the figures; the valve is at once lifted from its seat and a passage opened through the tube. When the end of the arm in its descent has reached the surface of the water, its level is indicated by the position of the pointer in reference to the figures upon the dial face.

Upon restoring the handle to its original position, the valve rod reaches the depression of the cam and the valve is allowed to close.

The advantages of this instrument over the gauge cocks commonly in use, are, its adaptation to denote the *exact* height of water—its freedom from leakage and consequent cleanliness, as well as its non-liability to the choking and stoppage incident to the ordinary form of gauge cock.

The comparatively small space occupied by the instrument is also worthy of consideration. The funnel for receiving the discharged water need not exceed one-and-a-half inches diameter, and the entire arrangement will occupy considerably less room than is required by a set of gauge cocks, with their customary appendages.

Electric Light.—The electric spark which has been placed in the South Foreland High Light, by Prof. Holmes, to do duty for the six winter months, is not obtained from frictional electricity, or from voltaic electricity but from magnetic action. If an iron core be surrounded by wire, and then moved in the right direction near the poles of a magnet, a current of electricity passes, or tends to pass, through it. Many powerful magnets are therefore arranged on a wheel, that they may be associated very near to another wheel, on which are fixed many helices with their cores, like that described. Again, a third wheel consists of magnets arranged like the first; next to this is another wheel of the helices, and next to this again a fifth wheel, carrying magnets. All the magnet-wheels are fixed to one axle, and all the helix wheels are held immoveable in their place. The wires of the helices are conjoined and connected with a commutator, which, as the magnet-wheels are moved round, gathers the various electric currents produced in the helices, and sends them up through two insulated wires in one common stream of electricity into the lighthouse lanthorn. So it will be seen that nothing more is required to produce the electricity than to revolve the magnet-wheels. There are two magneto-electric machines at the South Foreland, each being put in motion by a two-horse power steam engine; and, excepting wear and tear, the whole consumption of material to produce the light is the coke and water required to raise steam for the engines, and carbon points for the lamp in the lanthorn. The lamp is a delicate arrangement of machinery, holding the two carbons, between which the electric light exists, and regulating their adjustment; so that whilst they gradually consume away, the place of the light shall not be altered. The electric wires end in the two bars of a small railway, and upon these the lamp stands. When the carbons of a lamp are nearly gone, that lamp is lifted off and another instantly pushed into its place. The machines and lamp have done their duty during the past six months in a real and practical manner. The light has never gone out through any deficiency or cause in the engine and machine house; and when it has become extinguished in the lanthorn, a single touch of the keeper's hand has set it shining as bright as ever. The light shone up and down the Channel, and across into France, with a power far surpassing that of any other fixed light within sight, or any where existent. The experiment has been a good one. There is still the matter of expense and some other circumstances to be considered; but it is the hope and desire of the Trinity House, and all interested in the subject, that it should ultimately justify its full adoption.

Indian Mode of Sinking Small Deep Holes.—A very simple plan of sinking or boring narrow deep holes, such as are required for telegraph poles, or roofing pillars for temporary buildings, is in use in the Chittagong district in India, and we think that a hint might be taken from it for use here; it is this:—A bamboo of about three inches in diameter and of a given length is split up at the bottom for a distance of two feet, into eight or ten longitudinal sections, and each piece so split is sharpened into a point by a small saw or bill, (dâo). The earth, loosened by the coontee or crowbar at the bottom of the hole, is removed by the split bamboo, or as it is called here "joorga," in this manner. If the soil is clayey and hard, water is poured in, and the sharp pointed split end of the joorga being driven down, opens out and holds, as if in a vice, from four to eight pounds of earth, which is brought to the surface and removed from the joorga by gently tapping it on the ground. A hole can be sunk to almost any depth by this means, with a diameter only just sufficient to allow of the joorga to come up with its load of earth. Holes of nearly five feet in depth with a diameter of only nine inches have been sunk by this means in an incredibly short space of time. Mechanics will understand that the bamboo is by no means necessary for this operation, as it is plain that metal and other materials will properly replace it in this country.

The Industrial aspect of Tobacco.—Of that universally used plant, tobacco, there was consumed in England, in 1856, 33,000,000 pounds weight. This cost £8,000,000.—£5,220,000 of this amount being duty. There is a steady increase upon this consumption exceeding the contemporaneous increase of population. In 1821 the average was 11·70 oz. per head per annum, in 1851 it had risen to 16 36, and in 1853 to 19 oz. We hear of 200,000 hhds. of tobacco in the bonding-houses of London at one time. There are 90 tobacco-manufacturers in London, 1569 tobacco shops, 82 clay pipe-makers, 7380 workmen engaged in the different branches of the business, and no less than 252,480 tobacco-shops in the United Kingdom. In France much more tobacco is consumed, in proportion to the population, than in England. The Emperor clears 100,000,000 francs annually by the government monopoly. At St. Omer 11,000 tons of clay are used in making 45,000,000 tobacco-pipes. In the city of Hamburg 40,000 cigars are consumed daily, although the population is not much over 150,000; 10,000 persons, many of them women and children, are engaged in their manufacture. 150,000,000 cigars are supplied annually, and the business represents £4,000,000. In Denmark the annual consumption reaches the enormous average of 70 oz. per head of the whole population; and in Belgium even more—to 73 oz., or 4 3-5 lb. per head. In America the average is vastly higher. It is calculated that the entire world of smokers and snuff-takers consume 2,000,000 tons of tobacco annually, or 4,480,000,000 lb., as much in tonnage as the corn consumed by 10,000,000 Englishmen, and actually at a cost sufficient to pay for all the bread-corn eaten in Great Britain. Five million and a half of acres are occupied in its growth, chiefly cultivated by slave labour, the product of which, at twopence per pound, would yield £37,000,000. This narcotic is in use in every inhabited country of the globe. In Turkey, Persia, India, Siam, Burmah, and China, in particular do smokers abound. When we come to consider that the world contains at least one hundred million smokers, we shall have some idea of the vast effect which it must have upon the industrial and mechanical pursuits of the human race.

Errors.—If mistakes be often, be inevitably committed, let us register these mistakes; let us consider their causes; let us weigh their importance; let us inquire for their remedies. When from this we have fixed all the rules of conduct, we are *philosophers*. When we have reduced these rules to practice we are *sages*.—*David Hume.*

GAS IN NEW ZEALAND.—Gas—and gas from the brown coal of Auckland, in New Zealand—is no longer a matter of controversy. It is an undoubted fact; and after a trial of more than one kind of coal in Auckland, there can be no doubt that, though the Drury coal is not so "strong" for furnace purposes as English or Australian coal, it is fully equal to the average of both as a gas-yielding coal. To show how this experiment has been thus decisively tried in Auckland, we must hark-back over that indefinite space of time—a few months. The receipt of one or two small samples of Drury coal in that country led to their being forwarded for analysis to Sydney. This analysis led to a Sydney capitalist making an offer to establish gas works for this city, provided he could obtain a suitable site. No sooner had he made this proposition, than many parties became wonderfully solicitous for the health and wealth of the city. In the first place, gasworks would poison them; in the next place, gasworks were sure to be so profitable, that they ought never to allow "foreigners" to carry away the profits which legitimately belong to "native enterprise." So Mr. Huntley, of Sydney—the least like an adventurer we have met with—was sent back to the place whence he came, and the city of Auckland was preserved from being "poisoned" by gas. Unhappily for the peace of these Sleepy-Hollow philosophers, the proprietors of the *New Zealander* newspaper had long been dissatisfied with "Belmont Sperms," "Price's patents," "Stearines," and every other kind of composite of tallow, wax, arsenic, and such other compounds, as means of providing artificial light. Just about this period, an "unfortunate forty-acre man" and his partner (Messrs. Slater and Greenacre) arrived with a locomotive steam-engine, and with prospectuses of "Bower's patent National Coal-Gas Apparatus." The plans were examined, and an order for the apparatus sent home. In due course, it arrived. The works were erected, and, under the direction of Mr. Marks, a practical gas-engineer, completed—with a very inferior sample of Drury coal, a very superior gas was obtained—a gas remarkably clear and white for a first trial, and remarkably free from all mephitic odours. Without entering here into the respective merits of "brown" and "black" coal—of New Zealand (so called) "lignite" and the (so called) "true coal" of Australia and the "old world," we may repeat that we have not the least doubt as to the value of the Auckland coal for gas purposes, and that we confidently expect, before long, to see this coal exported to the sister colonies for the manufacture of gas. "Bower's National Coal-Gas Apparatus" combines both simplicity and efficiency in a remarkable degree. The mode of feeding the retort, by means of a screw, completely divests the manufacture of gas of its greatest source of nuisance—the raking out of the gas-exhausted coal:—this is now pushed out of the retort by each fresh charge, and, being conveyed into a reservoir of water, is at once extinguished, so preventing all nuisance from the mephitic fumes to be met with in the works of the great gas companies at home. The "purifier" works admirably: we do not believe that in the best managed gasworks of the old country, a clearer or purer gas is made than is yielded by the Bower's apparatus erected in Auckland. This experiment—if not the first, the largest and most complete ever tried in New Zealand—has been so satisfactory and successful that it ought to remove all fear of the manufacture of gas creating a nuisance or being prejudicial to health: while, as a question of economy and public security, the experience of the whole civilised world has long since proved the inestimable superiority of gas over every other available artificial light.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded January 20.

146. John Shaw, Manchester—Improvements in the construction of ventilators for hot-houses, conservatories, and other such buildings.

Recorded February 1.

260. Joseph Ambler, Little Horton, Bradford, Yorkshire—Improvements in looms for weaving.

Recorded March 1.

566. William Krutzsch, Chamber Street, Goodman's Fields—Improvements in cartridges and projectiles.

Recorded March 10.

658. John C. Hadden, 14 Bessborough Gardens, Pimlico—Improvements in the manufacture of projectiles, and of cannon for discharging the same.

Recorded March 13.

671. William E. Newton, Chancery Lane—Improvements in railway trucks and carriage wheels.—(Communication from William Wharton, jun., Philadelphia, Pennsylvania, U. S.)

Recorded March 14.

674. Gerhardus H. C. Jongkindt, Palace Road, Westminster Bridge, Surrey—Improvements in the method of and apparatus for making cakes and purified or refined oil out of cotton seed.

Recorded March 16.

695. George White, Dowgate Hill, Cannon Street—Applying as a substitute for the animal albumen hitherto obtained from bird's eggs or blood, certain parts of reptiles, fish, molusca, and articulated or radiated animals.—(Communication from Mr. Johann G. Leuchs, Nurnberg, Bavaria.)
698. Abraham Ripley, Bridge Street, Blackfriars—Improvements in the mode and process of treating the shavings, parings, and refuse of hides and leather, and also in the process and mode of treating or operating upon these and waste leather in order to produce a new article or fabric.

Recorded March 22.

740. John Stainthorp, Gracechurch Street—An improved method in coating or forming a hard shell on a candle at the time of moulding the same, and in apparatus connected therewith.
746. George B. Rennie, Holland Street, Blackfriars—Improvements in the construction and mode of working and employing floating platforms, pontoons, or docks for supporting ships or other vessels.

Recorded March 24.

770. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Certain improvements in the method of and apparatus for the manufacture of candles.—(Communication from Leopold Autran, Milan, Piedmont.)

Recorded March 26.

775. Charles Martin, Isleworth, and William Pidding, Borough Road, Southwark—Improvements in the manufacture of paper, applicable also to the manufacture of hats, bonnets, caps, and various articles of ladies' and gentlemen's wearing apparel, furniture, boxes, ornaments, bottles, casks, and various articles of utility, vehicles, houses, sailing and steam vessels, and boats, in the mixture of liquids, fibrous and other substances or materials for such purposes, and in the machinery connected therewith.
776. John M. Carter, Somerset House, Monmouth, Monmouthshire—Improvements in knapsacks and pouches for the use of soldiers and others.

Recorded March 27.

788. Thomas Briggs, Salford, Lancashire—Certain improvements in the manufacture of oil cloth or oil paper to be employed for packing purposes, or for coating or covering surfaces, and in apparatus connected therewith.

Recorded March 28.

797. Carl Barthelemy, Busch Lane—Using vacuum as a motive power, and of the means by which the same is effected.
800. Edward Ewer, Chapel Street, Curtain Road, Shoreditch—Improvements in fountain pens.

Recorded March 29.

808. August Pentzlin, Glasgow—Improvements in machinery for cutting wood.—(Communication from Theodor A. Prale, Hamburgh.)
810. Isaac Holden, St. Denis, near Paris—Improvements in means or apparatus for preparing and combing wool and other fibrous substances.
812. Benjamin Cooper, Frome, Somersetshire—Improvements in warping and beaming yarns preparatory to weaving.
815. Nathaniel Smith, and Robert Smith, Thrapston, Northampton—Improvements in the construction of haymaking machines.
818. James Buchanan, Glasgow—Improvements in the manufacture and finishing of heddles or healds for weaving, and in the machinery or apparatus employed therein.

Recorded March 30.

820. James Reidy, Cook Street, Cork—A machine for breaking stones and other hard substances.
822. John R. Breach, Leeds, Yorkshire—An improved household fire-escape.
826. William M. Chambers, Birmingham, Warwickshire—An improvement or improvements in the method of and apparatus for straightening angle-iron and other bar iron of a trough-like shape after it leaves the rolls, and while still hot.
827. Samuel B. Haskard, Wollaton Street, Nottingham, and John Dean and Edward Dean, Radford, Nottinghamshire—Improvements in machinery for the manufacture of looped fabrics.
829. Hermann Eschwege, Mincing Lane—Improvements in the manufacture of gin or geneva.

Recorded March 31.

830. Daniel K. Clark, 11 Adam Street, Adelphi—Improvements in steam engines and boilers.
831. John Sheridan, 55 John Street, Dean Street, Commercial Road, East—Improvements in the manufacture of sheet metal casks and other vessels.
832. Ernest Stelzel, Nancy, France—Improvements in ornamenting surfaces of glass, wood, plaster, and other materials, and in protecting them from the action of fire and moisture.
833. George H. Farrington, Cross Lane, Cannon Street—An improvement in the manufacture of envelopes.
834. Edward J. Hughes, Manchester—Improvements in the manufacture of oil of turpentine and resin, and in the apparatus connected therewith.—(Communication from James Napier, Brooklyn, U.S.)
835. William Clapham and John H. Clapham, Wilsden, Bradford, Yorkshire—An improvement in spinning, applicable to various kinds of yarns.
836. Richard A. Jefferson, North Street, St. John's Wood, and Matthew Jefferson, Crown Street, Finsbury—An improved construction of steam engine, applicable also to the raising of water.
837. Thomas F. Edgeworth, 147 Park Road, Toxteth Park, Liverpool—Improvements in obtaining light.
838. Henry Jones, Old Street, St. Luke's, and John Jones, St. Paul's Street, New North Road—Improvements in wet gas meters.
839. Franz Jaburek, Vienna, Austria—An improved pipe for smoking.

Recorded April 2.

840. Tellef Dahll, Krageroe, Norway—An improvement in the separation of nickel and cobalt from magnetic pyrites and bisulphuret of iron, or any other sulphur composition.
841. John S. Starnes, Cock Hill, Ratcliff—Improvements in signal and other lamps.
842. Henry B. Powell, Foxleize Park, Lyndhurst, Hantshire—A moveable stud or button.
843. Richard A. Brooman, Fleet Street—Improvements in buttons.—(Communication from Henry Dollier, Paris.)
844. Ebenezer Partridge, Stourbridge, Worcestershire—Improvements in axles and axle boxes.
845. Thomas Gamble and Edwin Ellis, Nottingham—Improvements in the manufacture of fabrics of the description known as bobbin net.
846. Cecil Johnson, Northumberland Street, Strand—Improvements in the manufacture of shoes and boots.

Recorded April 3.

847. James Robertson, Stanisby Road, East India Road—Improvements in the construction of furnaces or fire-places.
848. William Houldsworth, Bradford, Yorkshire—Improvements in machinery or apparatus for preparing cotton or fibrous substances for spinning.
849. Edmund Simpkin, Bury, Lancashire—Improvements in couplings for carriages, waggons, and other vehicles on railways.
850. William A. Gilbee, South Street, Finsbury—An improved apparatus for making signals on railways.—(Communication from Joseph Desgabriel, Lyons, France.)
851. Philip Woodruff, Machen, Monmouthshire—An improvement in the manufacture of iron from the puddling furnace for the purpose of rolling same into sheets intended to be coated with tin, lead, or any other metal, applicable also to the manufacture of all other sorts of sheet or bar iron, where toughness, strength, and ductility are essential.

852. Joseph Ambler, Little Horton, Bradford, Yorkshire—Improvements in looms for weaving.
853. John M. Jones, Netheravon, Wiltsshire—An improved apparatus for generating steam.
854. William E. Gedge, Wellington Street, Strand—Improvements in the construction and working of thrashing machines.—(Communication from Louis J. Ganne, Cour-Cheverney, France.)
855. William Rimington and William Rimington, the younger, Skipton, Craven, Yorkshire—Improvements in box hinges for swing doors.
856. Charles V. Walker, Fernside Villa, Redhill, Surrey—Improvements in the manufacture of troughs for receiving electric telegraph wires.
857. Joseph Schloss, Cannon Street—An improved plug for smoking pipes.
858. David G. Hope, Manchester, Lancashire—Improvements in slide valves of locomotive and other steam engines, and in gearing for working them.
859. Anthon N. Jensen, Chambers Terrace, Malden Road, Haverstock Hill—Improvements in brewing worts from saccharine and farinaceous substances, with a new method of retaining the aroma and better qualities of the hops, forming an inlalibly keeping ale nearly white and admitting of aeration, part of which improvements is applicable to distillers' wash, vinegar making, and preserving fermentable liquors.

Recorded April 4.

860. Henry M. Mellor, Arkwright Street, and Joseph Gee, Radford, Nottingham—Improvements in machinery for the manufacture of looped fabrics.
861. Thomas Ingram, Bradford, Yorkshire—Improvements in looms for weaving.
862. Abraham Pullan, Fortie Cottage, Newcross, and Thomas Cresswell, Ravensbourne Terrace, Lewisham, Kent—Improvements in the construction of steam, water, and other fluid gauges.
863. Edward H. Ashcroft, Boston, Massachusetts, U. S.—An improved hand drill stock—(Communication from Henry H. Packer, Boston, Massachusetts, U. S.)

Recorded April 5.

864. George Mallinson, Salford, Lancashire—Improvements in the manufacture of woven fabrics.
865. William F. Brown, Westgate Street, and Walter Jeffrey, Eastgate Street, Gloucester—A more convenient and effectual method of attaching and securing brooches and such like articles, and for improved fastenings to be used therewith, and for other purposes.
866. Edward T. Delafield, Brussels, Belgium—Improved apparatus and processes for decomposing neutral fatty bodies or matters into fatty acids and glycerine, and for the distillation thereof.—(Communication from Louis Martin, 209 Rue St. Jacques, Paris.)
867. Archibald White, Great Missenden, Buckinghamshire—Lifting at one lift a load of corn, hay, straw, or manure, or of other things.
868. William Leuchars, Piccadilly—Improvements in portable ink-holders and match boxes.
869. John H. Fuller, Hatton Garden, and William Davidson, Wisbeach, Cambridge—An apparatus for cutting or screwing pipes and round metal.
870. Vincent Rola, Southampton—Improvements in musical notation or symbolising musical sounds to be printed or represented on paper or other material with a view to facilitate the reading of music.
871. Joshua H. Wilson, Cornholm Mill, near Todmorden, Lancashire—Certain improvements in machinery to be applied in the manufacture of bobbins used in the preparing and spinning of fibrous materials.
872. William Parsons, Pont-ar-Tawe, Swansea—Improvements in the manufacture of wrought iron.
873. Charles Dusautoy, Laverstock, Southampton—Improvements in apparatus used in the manufacture of paper.
874. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—A new metallic alloy.—(Communication from Messieurs Charles Noel and Co., Paris.)
875. John Smith, Birmingham, Warwickshire—Improvements in the manufacture of buttons and other dress fastenings.
876. Alfred V. Newton, Chancery Lane—Improvements in the construction of pressure gauges.—(Communication from T. W. Lane, Meredith, New Hampshire, U.S.)
877. Alfred N. Newton, Chancery Lane—An improved arrangement of parts for supplying steam to steam engines.—(Communication from Lucius J. Knowles, Warren, Massachusetts, U.S.)
878. Michael Henry, Fleet Street—Improvements in the mode of and apparatus for obtaining motive power.—(Communication from Henry F. Gohade, Boulevart Saint Martin, Paris.)

Recorded April 7.

879. Henry Carter, Manchester, Lancashire—Improvements in machinery or apparatus for making gas burners.
880. William Clark, Chancery Lane—Improvements in fire-arms.—(Communication from the "Starr Arms Company," New York, U. S.)
881. William Clark, Chancery Lane—Improvements in axles or journals in combination with lubricating axle boxes for railway and other carriages.—(Communication from Mr. James H. Deming, Paris.)
882. William Clark, Chancery Lane—Improved apparatus for treating peat or turf.—(Communication from Auguste Marcelin, Count de Lara et du Ren, Paris.)

Recorded April 9.

883. Hiram L. Hall, Upper Bedford Place—Improvements in the manufacture of India-rubber cloth, japanned and leather cloths, and in the machinery or apparatus employed therein.
884. Courtenay Sprye, New Bond Street—An improved disengaging hook.
885. Andrew Howat, Farmworth, near Bolton-le-Moors, Lancashire—Certain improvements in miners' safety lamps.
886. Job Hamer, Longsight, Manchester, Lancashire—An improved manufacture of rugs, quilts, coverlets, or covers for beds, and of certain articles of wearing apparel.
887. Henry Bridle, Bridport, Dorsetshire—Improvements in refrigerators.
888. Gustave Bichlier, Salins, Jura, France—An improved apparatus to be employed for blasting rocks and the application of the same to the formation of tunnels.
889. Thomas Parker, Blackburn, and George Harrison, Burnley, Lancashire—Improvements in self-acting mules.
890. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in pumps for compressing elastic fluids.—(Communication from Germain Sommeiller, Turin, Sardinia.)
891. Thomas Aveling, Rochester, Kent—Improvements in locomotive engines.
892. Richard A. Brooman, Fleet Street—A new woven fabric and method of manufacturing the same.—(Communication from Louis N. C. Dupont, Louviers, France.)
893. Leopold Eidlitz, New York—Improvements in producing printing and other irregular surfaces by the aid of photography.

Recorded April 10.

894. Jacob Peacock, Blackburn, and John Garstang, Preston, Lancashire—Improvements in looms for weaving.
895. Louis J. Repelin, St. Marcellin, France—An expeditious mode of tanning.
896. Edwin Heywood, Haley Hill, Halifax, Yorkshire—Improvements in means or apparatus employed in winding yarns.
898. William E. Newton, Chancery Lane—Improved apparatus for superheating steam.—(Communication from Benjamin Normand, Havre, France.)
899. John Rigby and William N. Norman, Dublin—Improvements in guns and other fire-arms, and in cartridges to be used therewith.
900. John Rankin, Union Foundry, Liverpool—Improvements in mills for grinding bones.

Recorded April 11.

901. Pierre A. Gardrat, South Street, Finsbury—Improvements in the cleaning of the waste of wool, silks, cottons, and flax.
902. Henry Spence, and Joseph G. Spence, Birmingham, Warwickshire—Certain improvements in the manufacture of lacquer.
903. Robert Atkinson, Southampton Court, Tottenham Court Road—Improvements in chimney tops.
904. Thomas A. Turner, Birmingham, Warwickshire—An improvement or improvements in manufacturing the upper leathers of boots and shoes.
905. Thomas H. P. Dennis, Chelmsford, Essex—Improvements in the construction of iron buildings or glazed structures for horticultural or other purposes.
906. Joseph Kershaw, Allerton, Bradford, Yorkshire—Improvements in means and apparatus used in weaving.
907. Joseph Burrup, Gloucester, Gloucestershire—An improvement in ploughs.
908. Jasper W. Rogers, Peat House, Robert's Town, Kildare—Improved means of and apparatus for collecting the excrement of towns and villages, and for facilitating the drainage of houses.
909. Thomas Martin, Withybush, Haverfordwest, Pembroke—Improvements in the construction of roofs.
911. Edwin Westmoreland and William Westmoreland, Newdegate Street, Nottingham—Improvements in sewing machines.

Recorded April 12.

912. Charles Newbold, Nottingham—Improvements in machinery or apparatus for, and the method of manufacturing vessels and other articles.
913. John Webb, St. Austell, Cornwall—Improvements in the cartridges employed in blasting.
914. Meyer Drukker, London Wall—Improvements in clocks.
915. George Addenbrooke, Green Hill, Womburn, and Frederick Lewis, Pen Fields, Wolverhampton—Improvements in apparatus used in raising and lowering weights in mine shafts.
916. Thomas Trotman, Sheerness, Kent, and Adolphus Trotman, Beresford Street, Walworth, Surrey—Improved apparatus to be used in cleaning windows.
917. Jonas Bushell, William Bushell, Samuel Bushell, and Daniel Bushell, Great Snoring, Fakenham—An improved agricultural machine.
918. Hugh Smith, Glasgow—Improvements in machinery for cutting wood.
919. Jasper W. Rogers, Peat House, Robert's Town, Kildare—An improved mode of draining peat mosses, so as to render the peat obtained therefrom more useful as fuel, also improved means of and apparatus for drying and preparing the peat for fuel.
920. John Petrie, jun., Rochdale, Lancashire—Improvements in machinery or apparatus for washing rags and other materials used in the manufacture of paper.

Recorded April 13.

921. Origen Vandenburgh, Syracuse, New York—Improvements in projectiles and appliances of projection, imparting great precision and great range of flight to projectiles forced through the air by gunpowder or other explosive compound, with facility for rapid discharge, and for discharging many projectiles simultaneously by one projecting appliance with the same advantages, giving increased area to the space covered by the destructive projectile matter and light weight, and small space to the appliance for projection.
922. John Platt, Oldham, Lancashire—Improvements in mules for spinning and doubling.
923. Joseph Hill, Ipswich, Suffolk—Improvements in wire screens.
925. John W. Hadwen, Kebroyd Mills, Halifax, West Riding of Yorkshire—Improvements in machinery or apparatus for combing or cleaning silk, cotton, wool, and other fibrous substances.
926. Abraham Mitchell, Joseph Mitchell, and Benjamin Emmerson, Bradford, Yorkshire—Improvements in looms for weaving.
927. James W. Crossley, Brighouse, and John Crossley, Halifax, Yorkshire—Improvements in the construction of singe-plates, which improvements are also applicable to gas and other retorts.
926. William Burgess, Newgate Street—An improvement in mowing and reaping machines.
929. Thomas Fry, Brooklyn, Kings County, New York, U. S.—Improvements in castors for chairs and other like articles of furniture.
930. Thomas Edwards, Great Tindal Street Works, Birmingham, Warwickshire—Improvements in obtaining motive power.
931. Louis Dubois, Brussels, Belgium—Improvements in printing rollers.

Recorded April 14.

932. Edward J. Hughes, Manchester—Improvements in machinery or apparatus for sewing.—(Communication from James Wilcox, New York, and Edward Howard, Norfolk, Massachusetts, U. S.)
933. Jean J. L. Bremond, and Louis Z. Thuilliez, Boulevart St. Martin, Paris—Improvements in spindles and other parts of spinning looms.
934. John Notman, Plumtree Street, Nottingham—Improvements in sewing machines, and in the apparatus connected therewith.—(Communication from James C. Cropper, Broadway, New York.)
935. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Improvements in tha production of motive power and in the apparatus connected therewith.—(Communication from Jacques Belon, Lyons.)
936. Marc A. F. Mennons, Rue de l'Echiquier, Paris—An improved setting for lamp reflectors.—(Communication from Messrs. Gustave and Adrian Kunkler, Paris.)
937. Felix Fontenau, Rue de l'Echiquier, Paris—An apparatus for the preservation of life and property in cases of shipwreck.
939. Abraham Jones, Manchester, Lancashire—Improvements in machinery or apparatus for making rivets, screw blanks, and other such articles.
940. John Petrie, jun., Rochdale, Lancashire—Improvements in machinery or apparatus for drying warps for weaving.
941. Thomas Fisher and Edward Fisher, Wednesfield, Staffordshire—Improvements in steam engines.
942. Alfred V. Newton, Chancery Lane—Improvements in rotating breech fire-arms.—(Communication from Edward Savage, Cromwell, Connecticut, U. S.)
943. Sir John S. Lillie, Pall Mall—Improvements in carriage-ways.
944. Charles E. Wilson, and Henry G. Hacker, Monkwell Street—Improvements in machinery for the manufacture of chenille.

945. David Patridge, Woolwich, Kent—An improvement in or addition to apparatuses for superheating steam.

Recorded April 16.

946. Albert C. Richard, New York—The manufacture of improved machine belting and apparatus connected therewith.
947. Robert Brough, Cumberland Terrace, Camp Hill, and Richard Cox, Kingston Road, Birmingham, Warwickshire—Certain improvements in machinery for the manufacture of spikes, nails, pins, and rivets, and which said improvements are also applicable for partially forming or making chain links, holdfasts, staples, spouting hooks, and other such like articles formed of iron or other metal by forging, pressing, rolling, or drawing.
948. Charles Broglia and Pedro Pouchant, Clerkenwell—An improved apparatus to be employed in the roasting and preparation of coffee, cocoa, and chicory.
949. Thomas Burstall, Southall—Improved machinery for manufacturing bricks from clay alone or mixed with other materials.
950. William H. Muntz, Millbrook, Hants—Improvements in the construction of floating piers.
951. Thomas Walker, Birmingham, Warwickshire—Improvements in apparatus for indicating the height of water in steam boilers.
952. William Smith, Kennington Row, Kennington Park, Surrey—Improvements in paving or covering roads and other ways.
953. Jean B. A. Carpentier, Boulogne-sur-Mer, France—A new metrical apparatus with table.
954. Desmond G. Fitzgerald, Cambridge Street, and George Bate, Great George Street, Westminster—An improved method of igniting the charge in ordnance and other fire-arms.
955. William E. Newton, Chancery Lane,—Improved nippers for attaching blocks and tackles to ropes.—(Communication from William H. Allen and Andrew J. Bentley, New York, U. S.)
956. Albert Accarain, Limbourg, Belgium—Improvements in treating ores of zinc, and in the apparatus employed therein.
957. William Clark, Chancery Lane—Improvements in breech loading fire-arms, and in projectiles, as also in apparatus for reducing ordinary guns to condition suitable for such improvements in fire-arms, which apparatus is also applicable for other purposes.—(Communication from Messrs. Hugo F. Forbes, and Jean F. F. Challeton, Paris.)
958. Thomas Turner, Fisher Street, Birmingham—Certain improvements in rifling, applicable to either breech or muzzle-loading fire-arms or ordnance.

Recorded April 17.

959. Charles Stevens, Welbeck Street, Cavendish Square—An improved steam mill.—(Communication from Hypolitte Durand, Bordeaux, France.)
960. Charles Vaughan, William J. Vaughan, and Richard Vaughan, Birmingham—Improvements in the manufacture of hoes.
961. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in caloric engines.—(Communication from Milton A. Whipple, Boston, U. S.)
962. John Patterson, Beverley, Yorkshire—Improvements in apparatus for churning, which apparatus is also applicable to the washing of clothes and other articles.
963. Gustav Hansemann, Eupen, Prussia—Improvements in machinery for spinning yarns.
964. Henry Alcock, City Road—Improvements in puddling, balling, and mill furnaces.
965. William Carmont and William Corbett, Clayton, near Manchester—An improvement in casting steel tyres for wheels, which is also applicable to casting other articles of steel.
966. Samuel Cheetham, Manchester—Certain improvements in cop tubes.
967. William Bridgett, New Lenton, Nottinghamshire—The regeneration and expansion of steam, applicable to steam engines or for other purposes.
968. Charles De Jongh, Lantenbach, near Guebwiller, France—An improved mode of mounting the needles, points, and guides, used in knitting and lace machinery.
969. William E. Newton, Chancery Lane—An improvement in pianofortes.—(Communication from Spencer B. Driggs, New York, U. S.)

Recorded April 18.

971. John Shaw, and John Cook, Accrington, Lancashire—Improvements in looms.
972. Richard A. Brooman, Fleet Street—A method of, and apparatuses for, communicating to railway passengers the names of the stations which the train successively approaches.—(Communication from Alfred de Bauville and Emile Duclos, Marseilles.)
973. George W. Durham, Size Lane—Improvements in machines for washing rags, pulp, and other fibrous materials.
975. Henry Payne, St. James's Road, Old Kent Road, Surrey—Improvements in lowering ship's boats.
676. Walter Davenport, Bread Street—Improvements in roller window blinds.
977. William E. Newton, Chancery Lane—Improvements in pressing bonnets, bonnet frames and similiar articles.—(Communication from Mary Jane Osborne, Louisville, Kentucky, U. S.)
978. Marcus L. Byrn, New York, U. S.—An improvement in cork screws.
979. William E. Newton, Chancery Lane—Improved means of illuminating buoys, finger or direction posts, milestones, or other marks used at sea or on land, to guide or direct navigators or travellers, so as to render such buoys, posts, or marks visible at night.—(Communication from Mr F. M. Lyte, Bagneres de Bigorre Hautes Pyrenees, France.)

Recorded April 19.

980. Bernard Lauth, Manchester—Improvements in machinery or apparatus for straightening metal bars, rails, rods, tubes, plates, and other similar articles.
981. Samuel Wheatley and Alfred Milnes, Manchester—An improved grinding strickle, for grinding the cards on the cylinders of carding engines.
982. Benjamin Harben, and Richard L. Hathaway, Leadenhall Street—A substitute for ordinary butter, especially adapted for the use of pastry-cooks, biscuit-makers, and general culinary purposes.
983. Thomas F. Edgeworth, Park Road, Toxteth Park, Liverpool—Improvements in apparatus for heating fluids.
984. James Willis, Little Britain—Improvements in the manufacture of umbrellas and parasols, part of which improvements is applicable to walking sticks.
985. John Dale and Henrich Caro, Manchester—Improvements in dyeing cotton yarns or threads and fabrics.—(Communication from August Leonhardt, Berlin.)
986. Josef F. Mayr, Vienna, Austria—Improvements in the obtaining of light, and in the apparatus employed therein.—(Communication from Johann N. Reithoffer, Vienna, Austria.)

Recorded April 20.

987. William H. Kingston, A.B., Dublin—A coke furnace for the distillation of coals.—(Communication from Aime Bertholon, St. Etienne, France.)
988. Charles F. Schille, Nantes, France—A non-metallic composition to be used in the manufacture of water, gas, and other pipes or conduits, and machinery or apparatus to be used in such manufacture.
989. John Dyer, jun., Islington—A new or improved process for the ornamentation of certain articles of bed-room furniture.
990. Richard Roberts, Manchester—Improvements in punching machines.
991. Thomas G. Dawes, Wolverhampton, Stafford—Improvements in working hammers by compressed air.
992. William C. Ridings, Middleton, Lancashire—Improvements in machinery or apparatus for reading and repeating designs for perforating cards or paper for Jacquard weaving.
993. Thomas Boyle, Woburn Buildings, Euston Square—Producing multiplied and many-coloured reflections of light from one focus of incidence.
994. Hugh A. Silver, and James Barwick, Silvertown, Essex—Improvements in moulding India-rubber and other like gums in cells for galvanic batteries, and in insulations for telegraph wires.
995. William Lukyn, sen., Broad Street, Radford House, Ilkeston Road, Nottingham—A method of attaching artificial or natural teeth on expanded or contracted frames.
996. Abraham Denny, and Edward M. Denny, Waterford, Ireland—A revolving feed apparatus, as applied to singeing pigs, to facilitate the introduction of the carcases into the singeing apparatus.
997. James Walker, Walsall, Stafford—Improvements in railway sleepers.

Recorded April 21.

998. William Clark, Chancery Lane—Improvements in enclosing or covering opium and other matters.—(Communication from Mr. Pierre H. Aubergier, Paris.)
999. Tom A. Hedley, Banbury, and George H. C. Hedley, St. Neot's, Huntingdonshire—Improvements in valves and apparatus for regulating the flow of fluids.
1000. William Butlin, Northampton—Improvements in apparatus for super-heating the steam and heating the feed water in steam boilers.
1001. William Macnab, Greenock, Renfrewshire—Improvements in and connected with marine and other steam engines.
1002. Joseph Lewtas, Manchester—An improvement applicable to outside sun blinds.
1004. William Buckwell, Phœnix Stone Works, East Greenwich, Kent—Improvements in the manufacture of slabs, plates, and panels for the transmission of light.
1005. William Buckwell, Phœnix Stone Works, East Greenwich, Kent—An improved mode of operating, recording, or printing telegraphic apparatus.
1006. James Walker, Walsall, Staffordshire—Improvements in railway points or switches, and also in the keys for securing the rails in the chairs of railways.
1007. John Harvey, Circus Street, Marylebone Road—Improvements in safety valves.

Recorded April 23.

1008. John Parkinson, Victoria Brass Works, Bury, Lancashire—Improvements in machinery for separating small particles of iron or steel from brass and other metals or materials.
1009. Florimond Datichy, Paris, France—Improvements in apparatus for utilising the waste steam of steam engines.
1011. John Dangerfield, Tipton, Stafford—Improvements in apparatus or machinery for the manufacture of chains.
1012. Richard A. Brooman, Fleet Street—Improvements in milk cans.—(Communication from Louis P. Huard, Paris.)
1013. Richard A. Brooman, Fleet Street—Improvements in buoys.—(Communication from Francis Charles Vaunet, Paris.)
1014. George H. Birkbeck, Southampton Buildings, Chancery Lane—Improvements in machinery or apparatus for printing woven or other fabrics or tissues.—(Communication from Leon Malzard, and Edouard L. Dulac, Paris.)

Recorded April 24.

1015. Alexander Ritchie, Hillhead, Glasgow—An improved system of book-keeping.
1017. Edward Hillam, Baildon, near Leeds, and Richard R. Wilson, Halifax, Yorkshire—Improvements in apparatus employed in finishing textile fabrics.
1019. Edward Wilkins, Bath Terrace, Camberwell New Road, Surrey—Improvements in the manufacture of boots, shoes, and goloshes.
1020. David G. Berri, Bloomsbury—An improved date stamp.
1021. James Brodie, Bow, Fife—Improvements upon latches and bolts employed in locks and other fastenings.
1023. Francis Wrightson, Birmingham—Improvements in applying certain waste or refuse products to the purification of coal gas, and in utilizing compounds obtained in purifying coal gas.
1024. John Stafford, Oakerthorpe, Derbyshire and Benjamin Stafford, New Lenton, Nottinghamshire—An improved method of applying heated air or steam for drying stoves, or boiling liquids, or for other purposes.
1025. Charles E. Albrecht, Radnor Place, Hyde Park—An improved apparatus for sifting or screening.
1026. John W. Fuller, Deptford, Kent—An improved method of fitting dead-eye-chain and preventor plates to ships.
1027. William Clark, Chancery Lane—Improvements in the manufacture of ammonia.—(Communication from Messrs. Louis J. F. Marguerite and Alfred L. de Sowideval, Paris.)
1028. John W. Ford, Change Alley, Cornhill—Improvements in the driving gear of pumps.—(Communication from Charles W. Clements, Yarmouth, N. S.)
1029. Henry J. Morgan, Gloster Terrace, Hyde Park—Improvements in rockets.
1030. Alfred V. Newton, Chancery Lane—An improved construction of ship's stove.—(Communication from George A. New, New York.)

Recorded April 25.

1032. James Kennedy, Church Street, Millbank Street, Westminster—Improvements in the construction of sliding sash frames or windows.
1033. Theodore A. Claeys, Ostend, Belgium—Improved machinery for the manufacture of corks, bungs, and shives.
1034. Victor Lardin, Montigny-le-Roi, Haute Marne, France—Improvements in water pumps.
1035. Carlo Minasi, Saint James' Terrace, Kentish Town Road—Improvements in music stools and other seats and in stands for supporting music books and other articles.
1036. Asahel K. Eaton, New York—A mode of manufacturing steel.
1037. George J. Parker, Church Street, Stoke Newington—Improvements in the means or apparatus for raising water and other fluids.
1038. James Mason, Preston, Lancashire—Improvements in looms for weaving.
1039. Silas Nicholas, Buckland Street, New North Road, Hoxton, and Henry Leonard, Arlington Street, Islington—An improved fire guard or protector.
1040. Xavier Tarte, Rue de l' Union, and William Toovey, Rue de la Pompe, Brussels—Improvements in the construction of floorings and roofings and other parts of buildings and other structures, which improvements are also applicable to the construction of bridges and other works.
1041. Robert Seager, Ipswich—Improvements in the manufacture of boots and shoes.
1042. John G. West, Fleet Street—An improvement in compasses.
1043. Jules A. Hartmann, Mulhouse, France—The extraction of a certain colouring matter from rags and other waste vegetable textile fabrics containing the same.

Recorded April 26.

1045. John Clark and William Cross, Glasgow—Improvements in power looms for weaving checks.

1046. Andrew Robertson, Neilston, Renfrewshire—Improvements in steam-boiler furnaces.
1047. Ebenezer W. Fernie, Old Jewry Chambers—Improvements in open fireplaces and in their flues.
1048. William Bate, Wolverhampton—Improvements in attaching knobs to spindles of door locks and latches.
1049. James Wright, Bridge Street, Blackfriars—A new mode of preventing incrustations in boilers using sea or calcareous waters.—(Communication from Horace Gray, Massachusetts, U. S.)
1050. William Maltby, De Crespigny Park, Camberwell, Surrey—Improvements in the treatment of rice in order to manufacture starch, starch gum, and gums.
1051. George F Train, Liverpool—An improved system of railway or tramway to be used with horses or other power, and passenger carriages for the same.
1052. William Buckwell, Phœnix Stone Works, East Greenwich, Kent—Improvements in the construction of iron hoofs and bridges, and in apparatus to be used in their erection.
1053. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in portable bedsteads, and in the mattresses to be used therewith.—(Communication from Eugene E. B. St. Ange, Paris.)
1054. Richard A. Brooman, Fleet Street—Improvements in lamps.—(Communication from Jean J. Motel and Louis A. Guillemont, Paris.)
1055. William Clark, Chancery Lane—Improvements in boring bits.—(Communication from Messrs. Gabriel Coulonvrat and Auguste Genon, Paris.)
1056. William J. Harvey, Exeter—Improvements in the manufacture of breech-loading fire-arms, also in cartridges applicable for the same.

Recorded April 27.

1057. William Northern, Vauxhall Walk, Lambeth, Surrey—An improvement in the internal construction of kilns used for the burning of stoneware or earthenware of every description.
1060. William B. Taylor, Ballymena, Antrim—Certain improvements in looms for weaving.
1061. Peter Thorn, Cumberland Street, Plimlico—Improvements in signals, applicable to domestic and other purposes.
1062. George Ager, LL.D., Aylsham, Norfolk—Improvements in means or apparatus for breaking up or opening land.
1063. John Nichols, Pendleton, Lancashire—Improvements in looms for weaving.
1064. James Bullough New Accrington, Lancashire—Improvements in looms for weaving.
1065. Franz Thonet, Vienna, Austria—Improvements in the construction of wooden wheels.
1066. Josiah Lorkin, Brighton, Sussex—An improvement in the manufacture of gunpowder.—(Communication from Volney Maxwell, Wilkes Barre, U. S)
1067. Henry S. Rosser, Kensington—An improved sole to be worn in boots and shoes.
1068. William E. Newton, Chancery Lane—Improvements in ordnance and fire-arms.—(Communication from Charles F. Brown, Warren, Rhode Island, U. S.)
1069. Louis A Floirc, Boulevart St. Martin, Paris—An improved electric break.
1070. Thomas Sibley, Ashton-under-Lyne, Lancashire—Improvements in looms for weaving.
1071. George Withers, West Bromwich, Staffordshire—Certain improvements in fireproof wrought-iron safes, chests, or closets, in locks for the same, and other purposes, and for certain apparatus to be used in connection with the same.
1072. John V. Scarborough, and Daniel M'Millan, Belfast, Antrim—Improvements in the manufacture of boots, shoes, and clogs.
1073. William Low, Edinburgh—Improvements in machinery or apparatus for rubbing or finishing printing types.

Recorded April 28.

1074. John Sidebottom, Broadbottom, near Mottram, Chester—Certain improvements in looms for weaving.
1075. Thomas Molineux, Manchester—Improvements in pianofortes.
1076. Joseph Green, Leeds—An improved cutting and sawing machine.
1077. Andrew L. Dowie, Glasgow—Improvements in gas-burners, and in pressure-regulating apparatus for the same.
1078. Right Hon. Richard, Lord Berwick, Attingbam Hall, Salop—Improvements in rifling fire-arms.
1079. William H. Samson, Le Vol Farm, St. Brelade's Bay, Island of Jersey—A machine or apparatus for the cultivation of the soil.
1081. Edwin Southron, Broseley, Salop—An improvement in, or addition to, tobacco-pipes, and improvements in the manufacture and ornamentation of tobacco-pipes.
1082. John Grantham, Nicholas Lane—Improvements in apparatus for feeding furnaces with coals.
1083. Henry Rawson, Leicester—Improvements in machinery for combing wool and other fibres.
1084. John Grantham, Nicholas Lane—Improvements in slips for raising ships and vessels.

Recorded April 30.

1085. Georges Masure, Brussels, Belgium—Improvements in the construction of railway crossings.
1086. William Gossage, Widnes, Lancaster—Improvements in obtaining products by means of distillation and condensation, or by one of such means, from oily, fatty, resinous, and bituminous substances.
1087. John P. Gillard, Alfred Road, St. John's Ville, Upper Holloway—Improvements in apparatus for manufacturing gas for lighting and heating, and for obtaining motive power.
1088. George T. Bousfield, Loughborough Park, Brixton, Surrey—Improvements in apparatus for working the valves of steam engines.—(Communication from Edward N. Dickerson, Park Row, New York, U S.)
1089. Henry T. Green, Moreton, and Samuel B Wright, Barlaston, Staffordshire—Improvements in machinery for the manufacture of plain and ornamental bricks, slabs, tiles, and quarries.
1091. Edward T. Hughes, Chancery Lane—Improvements in jointing or connecting rails of railway.—(Communication from Pierre I. Leys, Amsterdam, Holland.)
1092. John Lansley, Brown Candover, Hants—Improvements in harrows.
1093. James H. Bennet, Vanburgh Place, Leith—Combined direct-action balance safety valves.

Recorded May 1.

1094. Alfred Upward, Brick Lane, St. Lukes—Improvements in apparatus employed in boring and tapping gas and water mains, and in fitting service pipes thereto.
1095. Francis Preston, Manchester—Certain improvements in breech-loading fire-arms, also in the machinery employed in manufacturing projectiles.
1096. James Taylor, Artillery Lane, Bishopsgate Street Without—Improved apparatus for preventing a downward draught of air in chimneys, and for causing the smoke to ascend, applicable also for the purposes of ventilation.
1097. John H. Walsh, Kensington—An improvement in breech-loading fire-arms, and in rests to be employed therewith, which rests are also applicable to other descriptions of fire-arms.
1098. George Bower, Droylesden, Lancaster—Certain improvements in metallic pistons.
1099. William Henderson, Glasgow—Improvements in the manufacture or production of nitrate of potash and soda, and in the application and use of certain products of such manufacture in the manufacture of soap.
1100. Alfred V. Newton, Chancery Lane—Improved apparatus for lifting vessels out of water.—(Communication from Horace I. Crandall, New Bedford, Bristol county, Massachusetts, U.S.)

Recorded May 2.

1101. Alexander Bain, Rahere Street, Goswell Road—Improvements in the means of obtaining copies of letters and other writings or documents.
1102. John Brown, Manchester—Improvements in the spouts or tubes of lubricating cans.
1104. William E. Gedge, Wellington Street, Strand—An improved apparatus for obtaining pneumatic power.—(Communication from Jean B. Tisserant, St. Michael Muse, France.)
1105. Benjamin Browne, King William Street—A self-heating ironing apparatus.—(Communication from Charles J. E. B. Caillouc, Paris.)
1107. Mathieu Bonnor, Eurville, France—Improvements in machinery for rolling bar iron, steel, and other metals or malleable matters.
1108. James Gardner, Eversholt Street—Improvements in metallic bedsteads.
1109. Thomas Silver, Philadelphia, Pennsylvania, U. S.—Improvements in the machinery for, and method of driving or communicating motion to, a ship's propeller.

Recorded May 3.

1110. Adam Dixon, Birmingham—Improvements in screw stocks and dies.
1111. James Brickhill, St. Leonard's Road, Bromley, and James Noble, York Street East, Stepney—Improvements in screw propellers.
1112. Alphonse R. le M. Normandy, Odin Lodge, King's Road, Clapham Park—Improvements in the construction of steam boilers.
1113. George E. Toomer, Hoaden House, Ash, Sandwich, Kent—An improved construction of plough.
1115. George Davies, Serle Street, Lincoln's Inn, and St. Enoch Square, Glasgow—Improvements in the manufacture of boots, shoes, and other coverings for the feet, and in apparatus connected with such manufacture.—(Communication from Alexander J. Duchatel, Paris.)

Recorded May 4.

1116. Henry Reid, Lee, Kent—Improvements in hoops for hooping casks, barrels, and such like articles.
1119. Thomas Heatley, High Hatton, Shawbury, and William Paddock, Shrewsbury, Salop—Improvements in threshing machines.

Recorded May 5.

1121. Daniel West, Egremont Place, Euston Road—An improvement for working the geometrical cotton press with steam power.
1122. Edwin Hardon, Stockport, Chester, and Lee Lee, Manchester—Certain improvements in finishing woven fabrics.
1123. Ellison Smith, Keighley, Yorkshire—An improvement in machinery for preparing wool, cotton, flax, and other fibrous materials.
1124. Joseph Grimmond, Dundee, Forfarshire—Improvements in weaving.
1125. William Denley, Exeter Place, Hans Place, and John Perrin, Walton Street, Chelsea—Improvements in fire-places and flues.
1126. William Hunt, Tipton, Stafford—Improvements in the manufacture of carbonate of soda, and in apparatus to be employed in said manufacture, also in utilizing waste products obtained in the said manufacture.
1127. Abraham Tweedale and John Tweedale, Healey Hall, and Samuel Taylor, Rochdale—Improvements in temples for looms and in indicating the number of picks made in such machinery for a given length of cloth.

Recorded May 7.

1128. James D. Dougall, Glasgow—Improvements in breech-loading fire-arms.
1129. William E. Newton, Chancery Lane—Improvements in the manufacture of glass.—(Communication from Richard H. Manning, New York.)
1130. William E. Newton, Chancery Lane—An improvement in rotatory planes.—(Communication from John Sperry, New York.)
1131. Martyn J. Roberts, Crickhowell, Brecon—Improvements in breech-loading fire-arms.
1132. Jacob A Eisenstuck, Chemnitz, Saxony—Improvements in knitting machinery.
1133. Josiah Harris, Threadneedle Street—Improvements in the manufacture of coke and charcoal from lignite, and obtaining products therefrom.
1134. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in pipe couplings.—(Communication from Messrs. Button and Blake, Washington, U. S)

Recorded May 8.

1135. John Corbett, Bromsgrove, Worcester—Improvements in evaporating pans for the manufacture of salt.
1137. William R. Barker, and Julius Schweitzer, Chapel Street, Belgrave Square—Improvements in the manufacture of artificial mineral chalybeate water.
1139. Daniel Sutton, Broad Street, Banbury, Oxon—Improvements in the construction of rollers for rolling and crushing land.

Recorded May 9.

1143. Robert Geoghegan, James' Street Brewery, Dublin—Improvements in machinery or apparatus for expressing liquids from various substances.
1145. Jean B. J. de Buyer, Rupt, near Scey-sur-Saone, Haut Saone, France—A new system of cast-iron cart-wheels.
1147. Archibald G. Shaver, New Haven, Connecticut, U.S—An eraser and pencil sharpener.
1149. Richard A. Brooman, Fleet Street—Improvements in horse mills.—(Communication from William W. Grollier, Poictiers, France.)
1151. William B. Johnson, Manchester—Improvements in steam engines and boilers, and apparatus connected therewith.

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 23d April, to 16th May, 1860.

April 23d,	4253	A. Fullarton, Edinburgh—Gas meter.
May 5th,	4254	R. Thomas, Birmingbam—Transplanting tool.
„ 7th,	4255	E. C. Grimsbaw, Denton—Apparatus for straining.
„ 10th,	4256	T. & R. Trotter, Lincoln—Twitch elevator.
„ 15tb,	4527	Bradshaw & Co., Bow Lane—Cooking stove.
„ —	4258	C. Bull, Old Kent Road—Oblong double nut.
„ 16tb,	4529	Lynch White, Upper Ground Street, S.—Gas valve.

HEATING STOVE FOR HOT BLAST SMELTING,

E. F. JONES, *NORMANBY IRON WORKS*, MIDDLESBRO' ON TEES,

PATENTEE.

Plate 258.

Fig. 1.

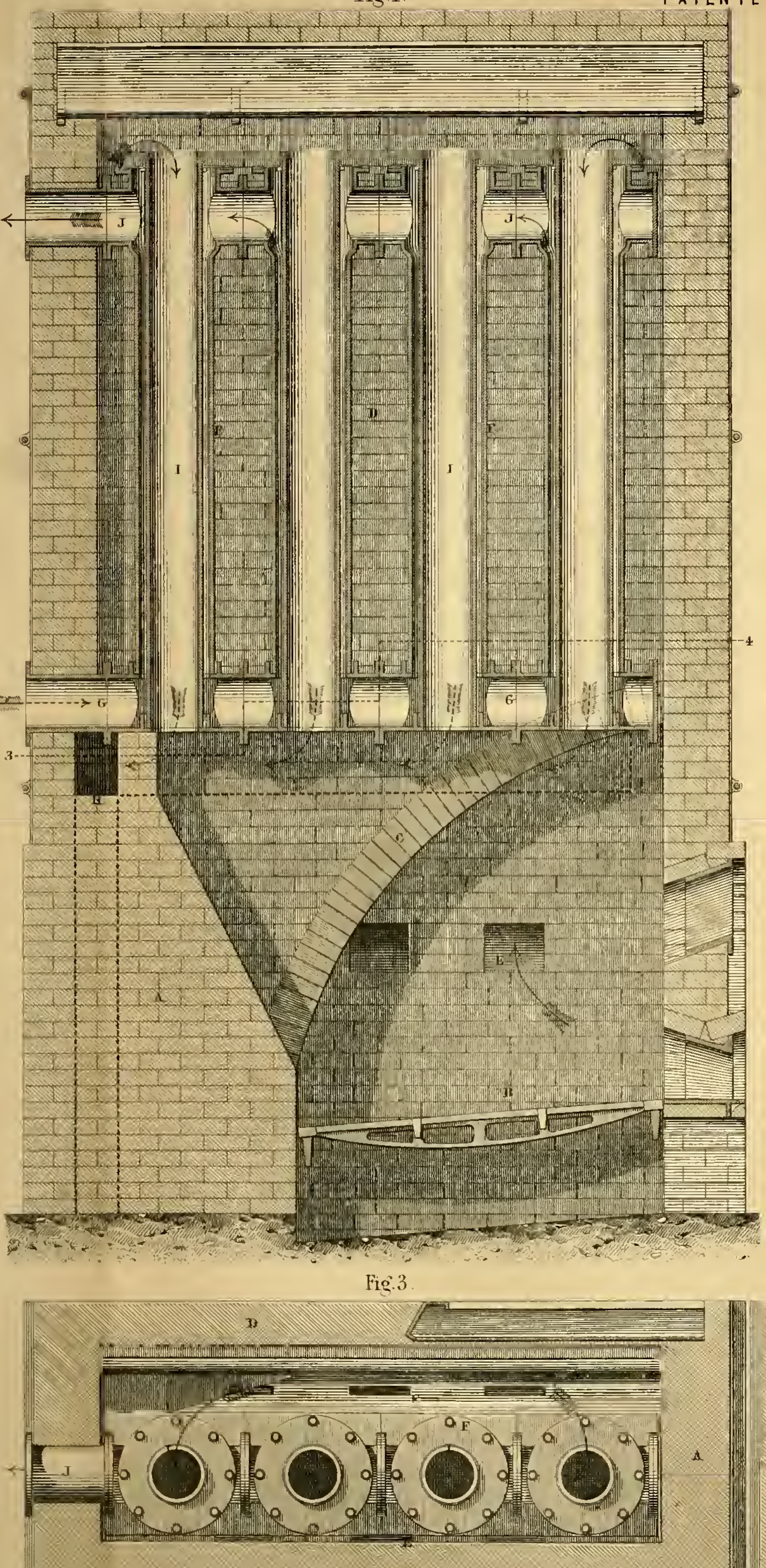


Fig. 2.

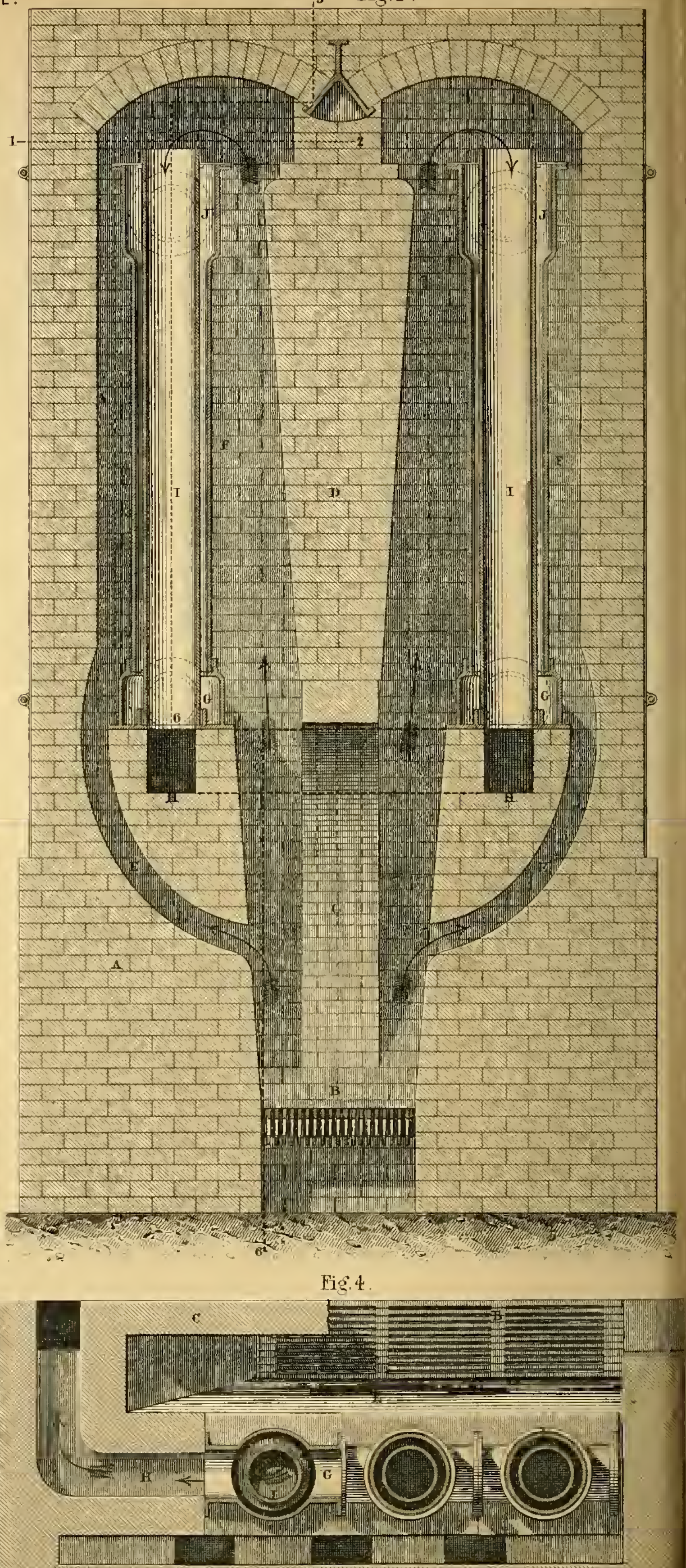
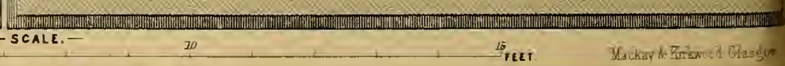


Fig. 3.

Fig. 4.



— SCALE. — INS 12 6 0 1 2 3 4 5 10 15 FEET

HOT BLAST FURNACE OR HEATING STOVE.

By E. F. Jones, Esq., *Normanby Iron Works, Middlesborough-on-Tees.*

(*Illustrated by Plate* 258.)

The useful application of a current of heated air in the manufacture of iron, was the means of effecting one of, if not the, most extraordinary developments of trade ever recorded in the annals of commerce. And, as may be readily imagined, when the superiority, as well as the great economy of the process became known, ingenious men applied themselves to the task of improving upon the original idea. Or rather, of still further economizing, by adapting the agent to the special object each had in view, this being done by means of furnaces and apparatus specially designed to utilize to the utmost extent the heat of the fuel employed. The result of all this ingenuity has been to increase to an amazing extent the manufacture of iron in this country, the statistics of which we have been careful to record at short intervals in our pages. And we now desire to direct the reader's attention to one of the most recent exemplifications of the hot blast principle, as carried out in the furnace or heating stove, illustrated in plate 258 of the present number. This heating stove is the invention of Mr. E. F. Jones, of Normanby Iron Works, Middlesborough-on-Tees. Fig. 1, on plate 258, represents a longitudinal vertical section of the furnace and air-heating apparatus, on the line 5, 6, fig. 2. Fig. 2 is a corresponding section taken at right angles to fig. 1; fig. 3 is a transverse sectional plan of one-half of the stove taken along the line 1, 2, fig. 2; and fig. 4 is a corresponding transverse section taken in different planes, as indicated by the line 3, 4, fig. 1.

The brick-work, A, of the structure is built of a rectangular figure, and is firmly bound together by means of angle plates and tie rods, as commonly practised; the lower part internally forming the combustion chamber, in which the fire-bars, B, are arranged. In front of this chamber two openings are shown in the brick-work. The lower one of which constitutes the ordinary fire door for the supply of fuel, while the upper one is adapted (if required) for the introduction of the waste gases from the head of the blast furnace. Springing from the back part of the furnace, B, is a brick-work arch, C, which extends over to the front wall of the furnace. This arch supports the pier, D, the brick-work of which is carried upwards in a gradually diverging figure; the upper part of the pier supports an iron skewback, from which spring the two arches forming the roof of the stove. The pier, D, thus divides the upper part of the stove into two chambers, in which the air-heating apparatus is arranged. The flame and highly heated products of combustion arising from the fuel in the furnace, B, pass partly up on each side of the pier, D, and partly through the laterally diverging flues, E, to the outer sides of the air-heating pipes. These flues open out from the furnace, B, and are carried upwards into the chambers above. The heated matters are thus divided into columns as it were, and which pass up on either side of the air-heating pipes, F, and so completely surround them. These air-heating pipes are arranged vertically in two parallel series, occupying the upper compartments of the stove, and they are connected at the bottom by the hollow junction pieces, G. These junction pieces form a horizontal tubular passage or air-way, extending from the exterior of the brick-work at the back of the stove to the front wall. The junction pieces are cast flat at the bottom, so as to form a species of sole plate to the series of vertical pipes, F; they are arranged on, and supported by the brick-work formed between the central part of the furnace and the flues, E. In this brick-work, a horizontal flue, H, is formed under each series of junction pieces, and these flues extend round to the back of the stove where they open into a vertical flue, dotted in fig. 1, and descend beneath the ash pit, or pass away by any other course, so as to carry off the products of combustion into the chimney. Circular openings are left in the junction pieces to admit of the open ended pipes, I, being fitted thereto. The pipes, I, are arranged within the air pipes, F, so as to leave a comparatively narrow annular space between the contiguous surfaces of the pipes, F and I. The heated products of combustion as they are given off from the burning fuel, circulate completely round the pipes, F, and on reaching the crown of the stove, they pass down the pipes, I, and from thence into the flue, H. The air to be heated passes in at the open end of the air passage, G, as indicated by an arrow in fig. 1, and as it passes through the annular space formed by the pipes, F and I, in a thin stream, it is exposed to the extended surfaces of these two pipes, and thus becomes highly heated. The upper part of the pipes, F and I, are arranged with tubular junction pieces, J, which permit of the free passage of the heated air without commingling with the smoke from the fuel. From the egress end of the air-pipe, J, the heated air is conveyed by means of pipes to the blast furnace, or applied to other purposes for which it may be required. This arrangement of heating stove is simple in its construction, easily got at in all its parts; at the same time it presents to the inflowing current of air a heating surface arranged in the most efficient manner, so that the gaseous products of combustion are utilized to the utmost extent before they are allowed to reach the chimney. In addition also to this, the weight of metal calculated to produce the requisite amount of heating surface, is so much less than that of the ordinary construction, as to lead to a corresponding and very considerable reduction of cost. Mr. Jones has also arranged a compact and convenient air-heating stove, in which the air and flue pipes are disposed horizontally. The expansion and contraction of the metal pipes are provided for in all cases by means of an efficient but simple expansive joint, consisting of an elastic plate of homogeneous iron, as shown at the upper part of the junction pieces, J, and internal pipes, I. Mr. Jones' system of heating, will, we believe, command the approbation of all those who are practically interested in the economical application of heated air to industrial purposes.

THE EXHIBITION OF 1862.

The ordinary course of human nature in all that we can observe, is to begin and finish. The two prime difficulties being *to* begin and *to* finish. The history of the interval between is a history of progression or retrogression, until the mind becomes satisfied that perfection has been attained, or is unattainable, and we hasten or flag in the particular pursuit accordingly as our energies have a prospect of reward, or are shut out from it. There are some few things which man has begun and has finished, or finished with—the discovery of the North-West Passage being perhaps the last, as it is not the least remarkable of them. There are many other things which we have begun, but which remain to be finished—of which the discovery, and theory and practice, of the true principle of taxation may be cited as an example, now much occupying the attention of statesmen. And, no doubt, there are myriads of things which have not only not been begun, but which have not yet been dreamt of.

One of those matters within the second category is that of modern Great Exhibitions. Whatever is worth doing is worth doing well, and we fully acted up to this in every particular as to the exemplar of 1851. Our test of a thing having been done well is an affirmative answer to the question, "Is its influence spreading?" The display made nine years ago was powerful in this respect. It is scarcely possible to overrate its influence, which in one particular alone—art education—is being felt throughout the kingdom. What it did as a stimulus to invention and improvement in manufactures cannot be curtly stated; but there can be little doubt, and we ourselves have no doubt, that a large majority of the more recent inventions and improvements is due to what then came before the observers having the right sort of eyes in their heads—eyes that kept sharp look-out and faithfully reported to reflection what they had seen.

We rejoice that it has been decided by the competent authorities that an opportunity shall soon occur to test satisfactorily the truth of the last remark. We are, it seems, to have another Great Exhibition in 1862. Despite numerous threatenings of war abroad, we, in this little snug corner of the world, with no adjoining hostile frontier making wry faces at us, are again to hold high festival. Purveyors are even already bustling about to supply worthily the festal board. The joyful sound has already gone forth into all lands, and the white, and red, and yellow, and black races of the earth are already *beginning* to collect their strengths, and respond to the call made upon them. It cannot be doubted that it will be another glorious thing, to be cherished fondly in the memory as a whole, and to be regarded by very many with gratitude, from a thousand different benefits to hand, and heart, and mind, perhaps even to soul; for who could have visited Hyde Park without receiving some increase of power, although unaccompanied by any of those sentiments which the consciousness of such increase always—*semper et ubique*—produces. And it is not likely that the exhibition of 1862 will be less effective in this respect than was that of 1851, even if war itself be raging furiously, so that it be not in our own little isle.

A year or two ago the idea was started. There were many *pro's* and many *con's*, and the pro's naturally "had it." Austria and France at loggerheads, extinguished the majority of the pro's, and forthwith the idea was abandoned.

It is now started again, and with a prospect of being carried out. The peace of Villafranca has produced this prospect, if nothing more; and it is reasonable to believe that it is such things that alone keep war away.

There is to be a guarantee fund of a quarter of a million, and when one individual commences the subscription towards it with no less a sum than £10,000, it is not to be wondered at that the munificent example shown by M. Uzielli has been perfected.

Something appears to depend too, towards realizing the idea, on the Royal Commissioners of 1851. It is to be trusted that no red-tapism will interfere, and prevent them doing what is right and proper to be done. What fear then? The guarantee fund will secure an adequate building, which it is proposed shall be vested in the authorities of the Society of Arts, so as to form a perpetual receptacle for future stores of the kind. The "Paxton style" modified will, doubtless, be the style of building which will be adopted; but to support the intention of permanency, the modifications will no doubt be great, and so great perhaps as to give some appearance of novelty to the structure.

So much for the housing of the collection. With regard to the collection itself, two points require attention:—1. What we are promised. 2. What we ought to expect.

In the first place it will be greatly different from the collection of 1851. We could bear then what we cannot now. Hundreds of things were novel then—indeed, what was not?—but we were familiarised with them, or they have since been so familiarised to us, that it would be dull monotony to have them over again. We are to have the best only of all manufactures, with the entirely new and welcome feature, a picture gallery; and the manufactures are to be arranged in classes, without geographical distribution. This will enable the authorities to receive only the finest productions in each class, and the public to compare their relative excellence more readily. We hope the paintings will be accompanied with drawings, for the latter are things with which the general public ought to be made more acquainted. There exist but few means towards that at present, and, with the exception of those at South Kensington, we know not how any one is to see any drawings, unless he be acquainted with one or more collectors, and they comprise a very limited circle.

It is wise, as it is proposed, to have the exhibition in London—the great beating heart of the world—and how immense and valuable are the stores already in it, which it would occupy but an hour or two to dislodge from their resting place for ages, and set up for the satisfaction of rational curiosity. Besides, London is, as yet, the largest port both for export and import, and as such it can more readily send its messages abroad and receive consignments at home.

The last exhibition has produced some noble results, as we have shown, and these results have been far more beneficial than were originally expected. Some enthusiasts would ask for more and greater; but the precept, *festina lente*, is the best to have been acted on. Why not, however, extend the collection about to be made, and extend it in such a way as not to necessitate one single extra argosy to be freighted with peculiar treasure.

This leads us to the second point we would draw attention to, and to consider what we ought to expect in the coming display.

The collection should be extended to other than mere material things —things that may be attractive to the senses alone. Man's achievements do not only consist in works of art or manufacture, however exquisite they may be. His highest achievements are to be known in the truths which he has conquered, and upon which, indeed, either to a great extent, or wholly perhaps, all or most of his other accomplishments are founded. *Let us take stock of all our attainments!* Let posterity be enabled to point to 1862 and say, "Thus far did our fathers go in all things." Let us set a mark on the forehead of the world. Let us show its actual position—its actual circumstances with regard to all labour and learning. We would dispense with history, but we would record all that is really known or believed to be known. Discoveries do not come in order of their greatness, and we would simply lay down a chart of them. We would have a true encyclopædia. We would have shown plainly and intelligibly, by competent committees on subjects familiar to them, what truths the *novum organon*, whether *renovatum* or not has produced in theory and practice; or, in other words, the cardinal points of science and skill. Nowhere has this thus been done. Our truths and attainments lie scattered through masses of literature, which are frightful and forbidding. We would have it all hauled over, shaken, and sifted—the gold separated from the dross, and that which is true, or as near truth as we have been able to ascertain it, divided off from the false or approach to the false. We want no names of men, but only their acts. Names must be left to honour in other places. In some departments of science prizes might be offered for the best detail of ascertained truths; one condition of which should be that rhetoric should give place to fact, and that amplification should yield to brevity. The prizes should be in money, and of amounts sufficient to attract competition by the best in the land, and be a proportionate excitement to draw forth some good stuff, which may be doubtless locked up despairingly in the mind of some poor, modest, and neglected genius. Each catalogue, for it would be little more, should be as a mirror, showing the mind and hand of man at the particular time. We should be able, by means of the several catalogues, to count upon capital in all learning, not for vain glorification, but as an incentive to steps to be made thereafter in our ascent to further progress. Instead of glorification, indeed, we do not doubt at all, that we should all be thunderstruck at the conviction which would be forced upon us, of how *very little* is really known—how very little has yet been done—and the consideration of this would have the salutary effect of instilling into us all that desideratum of all desiderata of the age, true humility; which, as the wise man of old told us, goeth before honour.

HISTORY OF THE SEWING MACHINE.

ARTICLE XXVIII.

An embroidering machine was patented by Matthew Dunnet, on the 23rd of April, 1857, wherein a large number of needles are used, and the fabric is moved in a frame according to the pattern to be produced.

Mr. Clark also obtained a patent on the 24th of April, for an embroidering machine, communicated to him from abroad. This machine is, however, of too complicated a nature to be intelligible without drawings.

Frederick Whitaker obtained a patent on the 15th of May, 1857, for an invention consisting chiefly in the application to sewing machines of the mechanical arrangement or modification thereof, used in the manufacture of looped fabrics and known as the "needle (or hook) and presser," in combination with an eye pointed needle for the production of various kinds of sewing or tambour work.

On the 20th of May, 1857, Abel Foulkes obtained a patent for improvements in sewing or pointing gloves, the essential features of which are—a mode of producing the raised seams of gloves by means of a sewing machine, in which the folded leather or other material composing the glove is propelled by a one-sided claw or feeder, and is kept in contact with a raised guide on the table, or on a moveable portion of the table. Also, in producing the stitching on each side of the raised seams of a glove point, by means of a sewing machine in which the glove is guided by its seam entering a groove in the table, or in a moveable portion of the table. Also, in constructing sewing machines with a raised guide on the table, or on a moveable portion thereof, in combination with a one-sided claw or feeder, and adapted for producing the raised seams of gloves. Also, constructing sewing machines with a groove in the table, or in a moveable portion of the table, and on one side of the needle; and adapted for receiving and guiding the seam of a glove whilst being stitched or pointed.

William Edward Newton obtained provisional protection on the 21st of May, 1857, for certain improvements communicated to him from abroad, which improvements consist in uniting fabrics by means of a single thread, carried by a shuttle and drawn through the cloth by the aid of a hooked or barbed needle, in such a way as to effectually tie or knot the thread at every stitch, and so produce a firm stitch from a single thread, the ripping or unravelling of the seam being thereby rendered impossible.

We presume this is merely a reapplication for the same invention as that which we noticed so favourably in our preceding article last month. We had hoped that this invention would have been eventually fully patented and specified, and that consequently we might have been in a position to supply our readers with full details of the machine.

A patent was granted to George Mumby on the 9th of June, 1857, for improvements in ornamenting or embroidering fabrics by means of peculiar appliances to be used in connection with a sewing machine. These improvements consist—*Firstly*, in embroidering, by forming a looped or piled design on any suitable material, by means of a needle receiving a compound motion, and working in combination with a supporting wire for holding up the loops to form the pile if necessary. These loops, which are worked into the fabric by a sewing machine, may be subsequently cut so as to form a pile, by any suitable means. *Secondly*, fixing the embroidering machine to a moveable lever for the purpose of placing the embroidering needle in any required position over the fabric. *Thirdly*, attaching braid or trimmings to the surfaces of fabrics by means of a guide fixed to a shoe, through which guide the braid or trimming passes from a bobbin to the material, to which it is fixed by the sewing apparatus. *Fourthly*, in the use of one or more vibrating needles or thread carriers, for producing a braid on a fabric, and for forming a stronger stitch when used for sewing purposes. *Fifthly*, of a peculiar construction of adjustable shuttle driver for regulating the throw of the shuttle in its race. *Sixthly*, winding thread upon a bobbin by fixing it to the axis of the fly wheel. We doubt the novelty of this arrangement. *Seventhly*, tightening the shuttle thread of sewing machines by a flat or round spring, or by passing it round a wire. We fear also that this is scarcely new. *Eighthly*, in sewing an edging or binding on to cloth or other material, by the aid of a guide and lever, to which an oscillating or vibratory motion is imparted for placing the edging in its proper position.

John Henry Johnson obtained a patent on the 15th of July, 1857, for an invention communicated to him by Mr. J. E. A. Gibbs of the United States. This machine is intended to sew with a single thread, by the aid of a peculiar revolving hook. As a full description with illustrations of Mr. Gibbs' machine is given at page 66, vol. iii, *second series*, any further description here is unnecessary. Provisional protection was accorded to John Henry Johnson for improvements communicated to him from abroad, bearing date the 4th of August, 1857, which improvements are comprised under seven heads, viz.:—*First*, driving the circular needle in sewing machines, wherein that form of needle is used by means of a spiral groove made in the vertical spindle of the needle, and actuated by an elastic driver working up and down the groove, so as to turn the needle to and fro as required. *Second*, forming a flat or straight portion on the vertical stem of the circular needle, for the purpose of holding that needle stationary, whilst the driver continues to travel a certain distance, and thereby cause the circular needle to pause or dwell in its movement during the descent of the vertical needle. *Third*, the use of an elastic driver composed of several layers of flat blade springs. *Fourth*, attaching this driver to the opposite end of the vertical needle lever, which extends below the bed plate of the machine, such lever being of a ⊃ shape, and forming a rigid communication between the driver on the end of the lower limb and the vertical needle connected with the end of the upper limb, so that the two will be moved simultaneously by one piece of actuating mechanism or cam, the fulcrum or working centre of the lever being situate at the bend thereof. *Fifth*, applying the power which operates the vertical needle lever directly, or nearly so, below the vertical needle, when such lever is made rigid or without a joint. *Sixth*, placing India-rubber, or other elastic sound deadening material, between the machine and the table which supports it, thus obviating the unpleasant noise, which usually arises in working sewing machines. *Seventh*, driving the machine by a band of India-rubber, shrunk on to the grooved periphery of one of the pulleys which give motion to the mechanism, such band projecting sufficiently far beyond the periphery to take into a corresponding groove made in a second pulley, so that the two pulleys will have a layer of frictional material, interposed between their peripheries, whereby the use of toothed gearing is dispensed with. This strikes us as being a very excellent idea; we have seen it in operation, and its simplicity, cheapness, and efficiency, greatly recommend it for all purposes of transmitting rotatory motion, where no great resistance or power is required.

Fig. 185. Fig. 186. Fig. 187. Fig. 188.

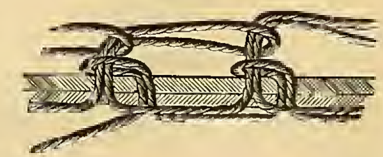
George Tomlinson Bousfield, obtained a patent on the 13th of August, 1857, for improvements in sewing needles. These improvements consist in making the eyes of sewing needles by punching or drilling in the ordinary manner, but in addition thereto, a slit or opening is made into the eye in such a manner as to admit of the thread being introduced or slipped laterally therein, in place of being passed endwise through the eye, by which the operation of thread ingthe needle is greatly facilitated. The sides of the opening or slit spring together, after the thread has been inserted; and the entrance of the slit at the external surface of the needle into the eye is made somewhat open, so as readily to receive the thread, whilst the entrance is so formed and rounded off as not to catch the fabric when the needle is being passed through it in the act of sewing. Of the annexed illustrations, fig. 185 represents an enlarged view of a hand sewing needle, having the eye constructed on the principle above described. Fig. 186 is a machine needle, having its eye near the point, and constructed on the same principle as fig. 185. Fig. 187 is another machine needle, the form of the eye being slightly modified, and fig. 188 is a hand sewing needle on the same principle.

Earle Henry Smith, of New York, obtained provisional protection on the 27th of September, 1857, for improvements in the constructive details of sewing machines, comprising a means for preventing the cams from working loose and rattling, by making them in two halves adjusted together, so as to bear or act upon rollers, one above the other, on the arm to be moved, one roller bearing on one side, and the other on the diametrically opposite side of the cam. The shuttle is made of an annular form, and receives an alternate or a circular motion, the needle being made to continue rising whilst the shuttle passes through the loop, so as to lift the shuttle and avoid friction. The feed motion consists of a toothed plate in the bed having an alternate motion, and the presser pad or foot above the cloth carries fingers or palls to keep the cloth, from being drawn back by the toothed plate. A self-accommodating foot is used for pressing on the cloth, such foot being set on a universal joint or helical spring, so as to adjust itself to the surface of the cloth, which is often irregular on account of its different thicknesses. Motion is imparted to the needle bar, and to the reciprocating shuttle (if used) by means of cranks and links in connection with the shuttle and needle bar, so placed that the cranks in opposite positions give a fast motion to the shuttle on passing the loop, whilst the needle moves slowly, and *vice versa*. The slack of the thread is also drawn up by a similar crank motion.

William Riley and Thomas Riley obtained a patent on the 3rd of October, 1857, which relates to the covering of the lists or edges of textile fabrics, in order to prevent their taking the dye during the process of dyeing such fabrics, and technically known as "saving," which is ordinarily effected by sewing by hand a web or binding of some other material round the edge or list of such fabrics. By this invention it is proposed to use a peculiar arrangement of apparatus, whereby this binding or "saving" may be accomplished by machinery. For this purpose rollers are arranged on a suitable frame-work, over which the fabric is caused to travel with the webbing to a series of guides or apparatus, which in succession turn up the edge or list of the fabric, and by degrees form a fold, lap, or roll, on the edge of the fabric, with the webbing outside forming a binding or covering to the list. A needle, with an eye near its point, and supplied with thread, is caused to pass through the edge of the fabric, when a fork or other suitable instrument takes hold of the loop and holds it until the needle is withdrawn, and then carries and turns the thread in the form of a loop round the fold or edge of the fabric, to a point on the top side where the needle will pass through the loop previous to its next insertion into the fabric, and thus link the last stitch with the succeeding one; the fork again takes hold of the thread when passed through the fabric, carries it round the edge of the list as before, and the operation is continued until the entire length of the webbing has been sewn on.

A patent was granted to A. V. Newton, on behalf of a foreign correspondent, on the 21st of October, 1857, for an invention, the object of which is the production, by machinery, of stronger seams than had been previously obtained, and also the increasing of the efficiency of action of sewing machines. The specification, which is too long and intricate to deal with in all its details, divides the invention into eight heads, viz.:—*First*, a new stitch made with two threads, called a "double back stitch." *Second*, a machine for making this stitch by means of two needles. *Third*, a new method of making the well-known "tambour stitch," in which one of the above needles is made to operate as a looper. *Fourth*, another method of making the "tambour stitch," consisting of a new device for operating the looper beneath the table of the machine, by means of a connection with the needle holder; and also, a new arrangement of the looper, to enable the needle to pass through the loop on its next descent through the cloth. *Fifth*, another apparatus for producing the "tambour stitch," in which the looper is caught by the thread as the needle rises, and is held in such a position as to open the loop for the needle to pass through in its next descent. *Sixth*, a new machine for making the stitch known as the "double chain stitch," in which two needles are used, one passing vertically through the cloth, and the other working horizontally and through the loop of the first needle; and also, a new method of operating the horizontal needle so that its motion shall be dependent on the motion of the vertical needle-holder. *Seventh*, a new apparatus for regulating the length of stitch in that class of machines wherein the cloth is drawn through the machine by a weight or by hand. *Eighth*, a new feed-motion. Fig. 189 is an enlarged view of the new or "double back stitch;" it is produced by the aid of two needles, each carrying a separate thread, and both working from the same side of the fabric. In producing this stitch, a loop of thread is first passed through the fabric to be sewn, then a loop from the second thread is passed through the fabric and through the first loop of the first thread. Another loop from the first thread is now passed through the fabric, through the first loop of its own thread, and through the loop of the

Fig. 189.



second thread, which completes the operation. Fig. 190 shows the relative positions of the two needles and threads as the second needle, B,

Fig. 190.

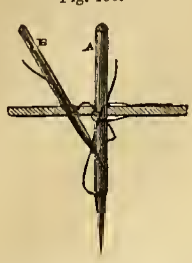


Fig. 191.

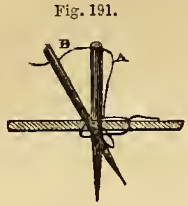
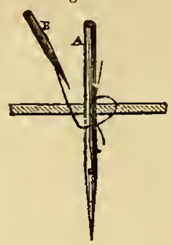


Fig. 192.



enters the loop of the first needle, A, which has penetrated the fabric. At Fig. 191 the first needle, A, is shown passing through the loop of the second needle, B, having previously passed through its own loop; and fig. 192 shows the loops of both needles round the first needle, A, previous to the tightening of the stitch. At fig. 193 we give a diagram showing the application of these two needles in the production of the tambour or plain chain stitch, the second needle, B, in this case acting as a looper. We pass over the other means of producing a tambour stitch, as we do not consider, from the nature of the stitch produced, that they will be found of much use to the public; the thing is so simple that any ordinary mechanic ought to be able to scheme a design of his own, for making the tambour stitch. Fig. 194 represents a front elevation of the work table, the needle bar and its guides, and the clamping foot of a sewing machine, and shows also the new feed motion, comprised under the eighth head of this invention, and fig. 195, is a plan of the clamping foot and "feeding hook." A, is the "feeding hook," which may consist either of a straight arm, terminating in a single sharp hooked point, or of a forked arm, terminating in two sharp hooked points, as shown in the plan, fig. 195. The latter form is preferred, as the points which are to catch hold of the fabric and draw it along, will operate equally on both sides of the needle, slots being made in the pressure or clamping foot, B, for the hooks to pass through, and act upon the fabric. The feeding hook is attached by a pin joint to an upright lever, C, which is suspended from a fulcrum or centre, in the ordinary fixed needle bracket, D, so as to be capable of moving in a vertical plane parallel with the direction of the feed motion of the cloth. The feed hook may be of sufficient weight to ensure the insertion of its points into the cloth, and permit of their drawing it along between the presser foot and the table, or if the hook is not made heavy enough to catch with sufficient tenacity, the shank or arm of the hook may be extended beyond the lever C, and connected to a light helical spring, E, for the purpose of forcing the points into the cloth. The requisite reciprocating motion of the "feeding hook" is effected by a wiper or tappet, F, attached to the needle bar, G, for the purpose of striking against the lever, C, each time the needle bar rises, whilst a helical spring, H, draws back the lever against a stop, I, also carried by the head of the fixed bracket, D. The points of the hooks will catch the cloth when moving in the direction of the arrow only, but when returning they will slide freely over its surface. The length of feed and consequent stitch may be varied by either adjusting the eccentric stop, I, or by shifting the position of the wiper or tappet, F.

Fig. 193.

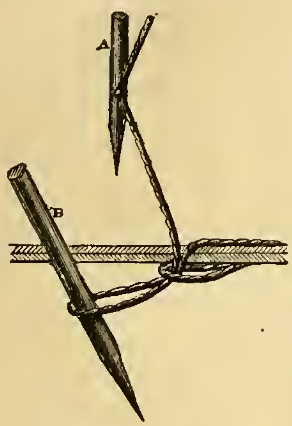


Fig. 194.

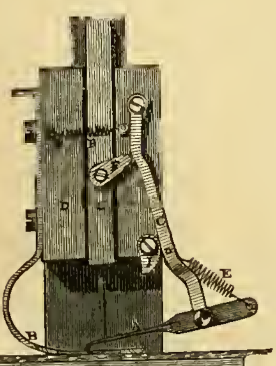
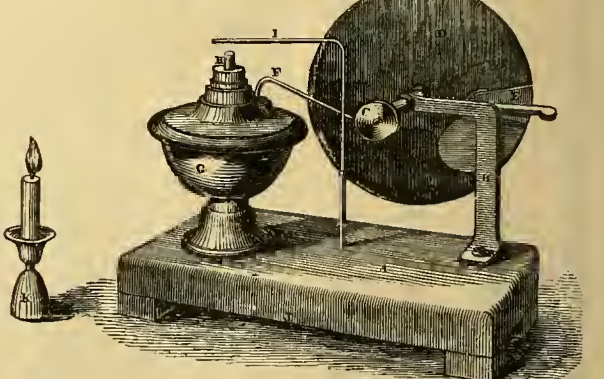


Fig. 195.

Another patent was granted to A. V. Newton, on the 23d of November, 1857, for an invention communicated to him from abroad, whereby the construction of sewing machines is simplified. According to one arrangement of the machinery, the fabric is fed forwards by the backward and forward traverse of the table, or of a horizontal slide attached to the under side of the under surface of the table. The same device which feeds the fabric is also caused to flatten and place the loop, formed under the cloth by the thread of the single needle machine, in the proper position for receiving the vertical needle in its next descent, so as to produce the well-known chain stitch. The device or slide which traverses the cloth forward, is serrated to ensure a proper contact with the cloth, and to prevent the cloth from moving back at the return motion of the slide. A serrated foot or pressing piece, holds the cloth down to the table. The slide receives its traverse motion from a vibrating bar, operated by a crank pin on the driving shaft. This bar, therefore, communicates the motion for the feed; and for flattening and holding the loop, instead of being attached to the table or a slide, it may effect the flattening and holding of the loop by means of a notched spring jointed to the underside of the table of the machine. When it is desired to make the double loop stitch (which requires the use of two needles) the slide, or its equivalent, is dispensed with, the feed being effected by a rocker above the table, and a second needle is employed, the same being secured to the vibrating bar or lever before mentioned, in such a manner as to work and take up the loops formed by the thread of the vertical needle. The rocker is a serrated segment piece jointed to a sliding bar, which is securely attached to the frame of the machine. A button pivoted on the same frame is caused to depress the sliding bar at the proper time, and through the rocker at its foot to feed forward the cloth. The button is acted upon by a pin on the needle slide, the ascent of which effects the movement of the cloth In connection with this rocker, when a single chain stitch is required, it is proposed to employ a sliding piece below the fixed table, fitted with a hinged lip, which will admit of the needle (after it has passed down into a hole made in the slide to receive it) passing out laterally with the thread which it carries. This slide, like that first mentioned, is intended to prepare the loop for the descent of the needle; and it is, therefore, like that slide, suitably shaped to flatten and hold out the loop. It is also operated in a manner precisely similar to the reciprocating sliding table, and horizontal needle above referred to.

ELECTRIC IGNITING APPARATUS.

A FEW years ago, an ingenious and highly philosophical instrument for obtaining instantaneous light, was brought out by M. Dobrienner. By means of this little apparatus, a jet of pure hydrogen is caused to impinge upon a ball of fine platinum wire, the gaseous current causing the metal to become instantly white hot. An analogous contrivance for effecting a similar object, that of obtaining light quickly, has been introduced and patented in this country by Mr. J F. Mayr, of Vienna. But in this apparatus, that potent and now most useful agent electricity is made use of as the igniting medium. The figure we have here engraved, is a perspective elevation of the simple means employed by the patentee.



The apparatus consists of a rectangular base, A, on which is fixed the standard, B. The free extremity of this standard serves as a bearing to receive a spindle, which terminates at one end in the knob, C, and at the other carries the disc, D. This disc is formed of a plate of hard India-rubber or vulcanite, which takes a polish resembling ebony; this material being a non-conductor of electricity, the disc serves the same purpose as the glass wheel in the ordinary plate electrical machine. A rubber or cushion, E, is fitted between the standard, B, and the face of the disc, D. The rubbing surface of the cushion is coated with the mercurial amalgam usually employed in frictional electrical machines. The electricity, as it is produced, is conducted away by the wire, F, which is fitted into an aperture at the side of the metal vessel, G. This vessel forms a holder or lamp, in which is contained sulphuric alcohol [not ether]. The vessel, G, is insulated by fitting it into a base of vulcanised India-rubber. At the upper part of the lamp, G, is inserted a cylindrical piece of charcoal, H, which becomes saturated by the sulphuric alcohol. In the base, A, is fitted a bent wire, I, which is made to turn round, so that it can be brought over the charcoal, H. When the lamp, G, is not in use, it is covered by the cap, K, which is made to serve also as a candlestick. Beneath the base, A, is a metal plate, J, which covers a receptacle for a supply of the amalgam, a cork, and a scraper to roughen the amalgam occasionally. The supply of amalgam enables any one to keep the apparatus in order for a long period. Light is instantly obtained by turning the conductor, I, over the charcoal, H, and giving the disc, D, a sharp turn or jerk by means of the knob, C. The electricity, which is thus produced, is conducted by the wire, F, to the lamp, G, and passes off to the wire, I, forming a spark which ignites the alcohol, so as to admit of a light being obtained from it. The apparatus is very compact, easily used, and there is nothing about it to break or get out of order.

FIRE ESCAPE.

The great majority of our houses have an inherent defect, which has been, during a course of years, the cause of great loss of life by fire. The cause of these catastrophes is mainly due to the use of wood in building the staircase of the house; so that upon a fire occurring and reaching the staircase, the escape of the unhappy inmates is cut off. For with the supply of the dry combustible material and increased area, the destructive element rages with redoubled fury, and in nineteen cases out of twenty, the staircase is the only accessible means of egress. How frequently do we read, in newspaper reports, that an inmate of a house on fire on opening the door of the bedroom finds the staircase in flames; the window then affords the only chance of escape. The houses built on the Scottish system are certainly much superior in this respect; the staircases are built wholly of stone, they are readily accessible from the several houses or flats on either side, and afford, under all circumstances, a safe means of egress. In the absence, however, of stone staircases, a multitude of contrivances, more or less ingenious, have from time to time been introduced with a view of saving life at fires. One essential point in the construction of these escapes is that they should be instantly available. If the apparatus be of such a nature that it requires to be put away, either because of it being unsightly, or because it is only of use under the special circumstances for which it was destined, then there is an end to its utility. To be of *bona fide* use in the moment of need, the fire-escape should be so arranged as to be a presentable object, otherwise useful if possible; but it must at all times be immediately at hand, and require no fitting together, or any adaptation which may involve a loss of time. Dr. R. Gardiner Hill, of Inverness Lodge, Brentford, has recently introduced a fire-escape which, we think, meets the requirements we have pointed out. The subjoined illustrative figures represent the escape when ready for lowering persons and property from a window, and when not in use. The escape consists of a rectangular framing of wood, which is bound together by means of tie rods; the bottom part of this frame is formed of a lattice work of thin iron. One side of the frame is made with a half door, as shown in fig. 1, to afford facility for getting out of the escape. The frame is covered at the bottom and round the sides with non-inflammable canvas. A ring is securely fastened to the floor or window sill of the house, and to this ring is simply hooked the end of a chain carrying a block through which the tackle of the escape is rove. One extremity of the lifting and lowering line is tailed and fastened to two rings on the front upper cross-bar of the frame, the rope passes over one sheave of the sustaining block, down through a guide, and under a pulley arranged between the uprights at the back of the frame. From this pulley the rope passes up over the second sheave of the block, down through a guide at the front of the frame, and between a double pulley at the lower part. A second, or downhaul rope is also fastened to eyes in the underside of the frame. The whole of the tackle and block are kept inside the frame when the escape is not in use, the hooking of the block chain to the ring being the only thing to be done when the escape is required to be brought into use. The lowering rope is thrown to the persons below, or the occupant of the escape may lower himself by its means. The escape is then hauled up to bring down other persons, or for removing property from the upper part of a dwelling. The frame of the escape is fitted with castors on the inner side, and when not in use it stands upon them, and is covered with an ornamental cover, as shown in fig. 2, which converts the escape into a convenient and handsome ottoman. In this way the fire-escape may at all times be kept near the window, from whence it would be used if required. It would, however, be as well to have all the upper windows provided with the means for attaching the chain of the block without a moment's delay. The facility with which this escape can be brought into use on an emergency, constitutes its most important recommendation.

Fig. 1.

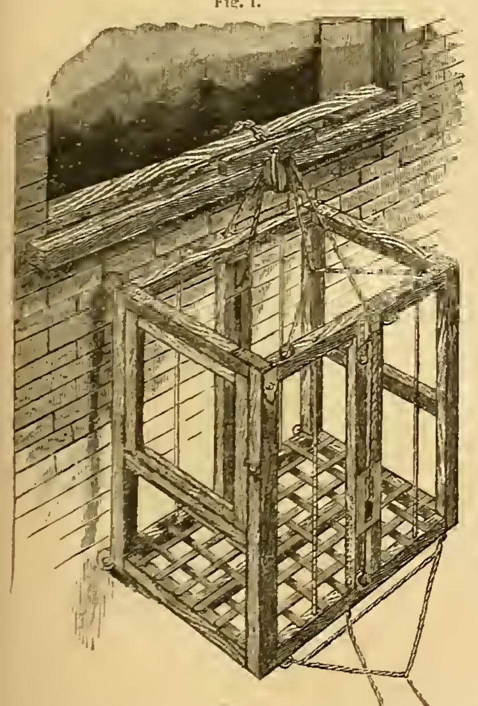
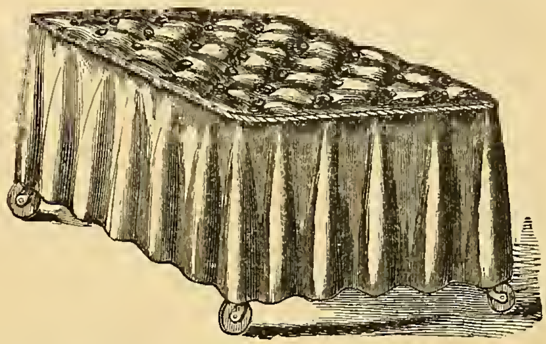


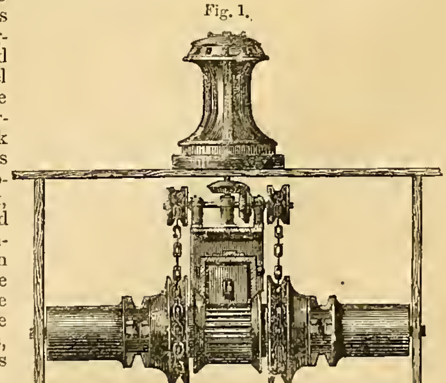
Fig. 2.



DYER'S DOUBLE-BODIED WINDLASS AND CAPSTAN.

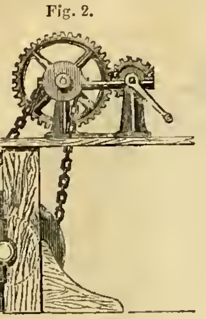
A simple and effective arrangement of a ship's windlass and capstan, has been brought into use by Mr. Samuel Dyer, of Penner Wharf, Bristol, the patentee of an excellent system of self-reefing and furling top sails. This windlass is worked by an endless chain, the motive power being placed at a convenient distance from the windlass; a wheel is fixed on the windlass, which prevents the chain from slipping, and a small wheel of the same kind is fixed on a horizontal shaft or spindle at a short distance from the windlass, and a chain is carried round the two wheels. On the spindle of the small chain wheels is fixed a large cog-wheel, which is worked by another cog-wheel of about one fourth the size, and turned by ordinary winch or crank handles. The windlass can be worked by a capstan on a forecastle deck, by means of a bevelled wheel fixed on the spindle, which gives motion to another wheel of the same kind fixed on the horizontal spindle of the small chain wheels, which work in bearings on the pawl bitt head. The capstan can be used separately when the windlass is not in use, by revolving on its own spindle; and when required to work the windlass, it may be connected

Fig. 1.



by means of a pin or block of iron, placed in an iron plate which is fixed on the top of the capstan spindle. Fig. 1, of the subjoined engravings, represents a windlass worked by means of a capstan in the manner referred to. Fig. 2 represents a section of a windlass worked from the forecastle deck, the motive power being placed on the top of the pawl bitt. Two cable holders are fixed on the body of the windlass for the purpose of heaving in the cable; in using this kind of cable holder in raising anchors, the chain cannot ride, surging is prevented, great protection is also afforded to the windlass and cable, and the labour of attaching tackles to the chain cable, to prevent it running back, is entirely dispensed with. In dropping anchor, the cable on this windlass is to be arranged and paid out in the usual manner; but in raising the anchor, the bite of the cable is placed in the cable holder, and the slack kept clear of the windlass. The body of the windlass is constructed of a wrought or cast-iron frame. To increase its strength, each part of the frame is filled in with wood, and bound at each end with an iron hoop. An important advantage of this windlass is, that it can be constructed in one or two parts, each part being made to work separately on one spindle, or at the same time; so that if, by heavy riding, one-half of the windlass should be rendered useless, the other half forms a perfect and independent body, which may be worked as well as if complete. The spindle is supported in the centre by an iron bearer. An endless chain wheel is fixed on each half of the windlass, and a small chain wheel of the same kind is placed on the horizontal spindle of the cog-wheel, and is connected or disconnected by means of a pin or block of iron, which drops into an iron plate fixed on the same spindle. The double windlass can be used in raising one anchor, or for any other purpose, while the other part remains stationary, or holding the second anchor. A more steady strain can be attained than by the ordinary windlass purchase; also a greater amount of power, and the windlass more freely worked. The jerking with a heavy strain, which often causes the windlass to get out of order, is dispensed with. There are no parts of the iron frame or of the windlass liable to disarrangement, or that require to be taken to pieces and refitted, as frequently occurs with the ordinary kind. Immense strength is gained, and there is no possibility of breakage; two rates of speed can be attained, according to the power required, by placing the handles on the spindle of the large cog-wheel.

Fig. 2.



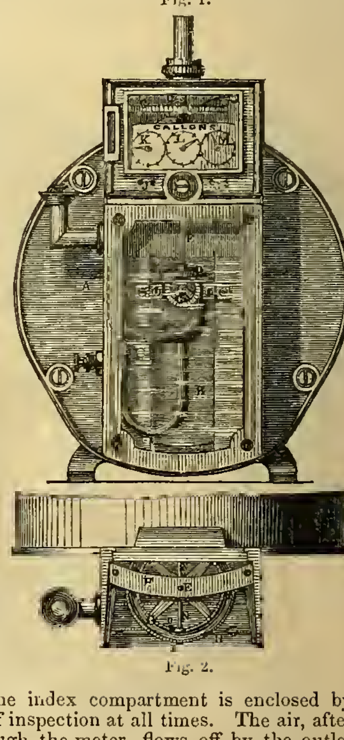
RECENT PATENTS.

MEASURING AND REGISTERING THE FLOW OF LIQUIDS.

James Sim, *Aberdeen—Patent dated Nov.* 25, 1859.

The improvements for which Mr. Sim has obtained a monopoly under these letters patent, relate to the adaptation and use of ordinary gas meters, or other fluid or liquid measures and registering apparatus, in the measuring and registering the flow or discharge of liquids under various circumstances, and in various conditions. The example selected as an illustration of the practical application of this invention is, the adaptation of the measuring and registering apparatus to a beer or wine butt, for the purpose of ascertaining and keeping an account of the quantity of liquid drawn off from time to time from the cask. The cask is furnished with a tap in the usual way; now, by means of the improvements no liquor can be drawn off or abstracted from the cask, without its being duly registered by the measuring apparatus. In the head of the cask is fitted a short piece of pipe, to which is adapted an air pipe; the free extremity of this pipe is connected by means of a union joint to the outlet aperture of the measuring apparatus. The apparatus the patentee prefers to use for measuring and indicating the quantity of liquor withdrawn from the cask, consists of a meter arranged and constructed internally in this modification, in manner similar to a gas meter of the wet class; the measuring medium being atmospheric air, which it is necessary to admit into the cask upon withdrawing any portion of the liquid contents. The air, instead of being allowed to flow into the cask through the spigot hole in the usual manner, is caused to pass through the meter, and the quantity thus admitted is registered on its index plate. The air passes into the meter through the inlet pipe, or other suitable apertures. The atmospheric air passing into the meter simultaneously with the drawing off of the liquor from the cask, causes the measuring drum of the meter to rotate, and so put in motion the train of mechanism connected with the indexes. This part of the meter, however, obviously requires a special arrangement of the index plate, so that the registration may be in imperial gallons and aliquot parts of the same, instead of cubic feet. The arrangement of meter which the patentee prefers to use for indicating the quantity drawn off is delineated in the accompanying engravings. Fig. 1 is a front elevation of the meter, with the front box and index compartment open to show the internal arrangement. Fig. 2 is a plan corresponding to fig. 1. Within the casing, A, of the meter is fitted the measuring drum or cylinder, B, which is similar to that of an ordinary wet gas meter. The spindle of the measuring drum carries upon its extremity the bevel wheel, C, which is in gear with the wheel, D, on the lower extremity of the vertical spindle, E. This spindle is carried in a footstep bearing, formed in a small bracket piece screwed to the front of the case, A, its upper end works in the cross piece, F, extending across the front box, as shown in fig. 2. On the upper part of the spindle, E, is fitted the crown wheel, G; this wheel is made with a long tubular boss, on the lower part of which is a worm. The wheel, G, works loosely on the spindle, E; it is made with deep duplex concentric rims, the upper edges of which are finely serrated in the form of ratchet teeth. A small pawl, H, extends over and falls into the teeth of the outer rim of the wheel, G, this prevents the wheel from moving in a backward direction, or to the right hand side. The rim of the wheel, G, is divided into thirty-two divisions, or other aliquot parts of a gallon, and the wheels, C and D, are so proportioned, that the wheel, G, makes one revolution as each gallon of air passes through the meter. Thus as each division on the rim of the wheel, G, passes the fixed pointer, I, it shows that one gill or fourth part of a pint has been withdrawn from the cask. The air enters the meter through the apertures, J, which are made in the frame of the index compartment, and passes down through openings in the diaphragm which divides the upper compartment from the front box. By means of the worm on the boss of the wheel, G, its motion is imparted to a pinion and wheel, which actuate the right hand index, J; the index plate is divided into ten divisions, indicating gallons. In this way each revolution of the wheel, G, causes the index, K, to move from one numeral to the next, one complete revolution of the index indicating ten gallons. A pinion on the spindle of the index, K, communicates its motion to the wheel of the second index, L, which indicates tens of gallons, and so on to the third index, M, which records the consumption or abstraction of the liquid in hundreds of gallons. In the event of the air in the meter expanding or increasing in volume by the addition of spirituous vapour, provision is made for the measuring drum turning in the contrary direction, without affecting the state of the index. On the spindle, E, above the wheel, C, is fitted a cross bar, N, which runs loosely on the spindle; on the extremities of this bar are fitted two pawls, O, which rest in the inner row of ratchet teeth. With this arrangement the rotatory movement of the spindle E, in a forward direction is imparted to the wheel, G, by the pawls, O, pushing the wheel round, which is prevented from moving backwards by the pawl. But upon the measuring drum being moved in the opposite or backward direction, the pawls, O, glide over the inner ratchet teeth, without moving the wheel, G, or affecting the state of the index. The index compartment is enclosed by a glass plate in front, to admit of inspection at all times. The air, after being measured and passed through the meter, flows off by the outlet pipe, and into the cask or other receptacle. In this way all the air which enters the cask to supply the place of the liquor, which is withdrawn, is duly measured and indicated, whilst the emission of the return air is provided for in the manner before described. The other parts of the meter are the same as are in ordinary use. The patentee has described his improvements as being carried out by means, or with the aid of a meter of the wet class, but he does not confine himself thereto, as meters of the dry class are equally applicable thereto. In this way the index plate may be arranged to register the consumption or abstraction of large or small quantities from the stock vessel or receptacle, so that the dealer or vendor can check the daily consumption, or as frequently as he may require. For spirit dealers and others, small sized meters

Fig. 1.



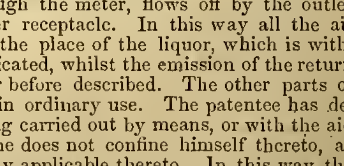


Fig. 2.

may be arranged iu connection with the spirit or other liquid receptacle, and these meters serve to keep an accurate account of the state of the stock, as well as a check on the persons in charge of the same. They are also equally applicable for breweries and distilleries, or other places where it is required to measure aud register large quantities of liquids.

ARTIFICIAL IVORY.

H. W. Patrick, *Acton.—Patent dated May* 26, 1859.

In prepariug this new substance, the patentee employs, either separately or combined in suitable proportions, amber, Canada balsam, the Australian gum kowrie, potato flour or fecula, and with these substances, or any of them, he combines meerschaum paper pulp, calcined bones, fluorate of silica, sulphide or sulphurets of mercury (vermillion), or of other metals, chloride of zinc or other metals, alkaline preparations, asbestos, fluxed or fritted colours, or finely powdered pumice stone, sulphur, India-rubber, or similar gums. Other resinous, glutinous, or amylaceous substances may be used with advantage, but those enumerated the patentee prefers. The combinations may be effected in various ways, such as by reducing the gums to solution, or "hard bodies," as precipitates, or by the application of heat. When solutions are adopted, the gums employed are dissolved in naphtha, mythelated spirits, chloroform, essential oils, or other suitable solvents, according to the particular substance to be treated. In this state of solution, or in a state of precipitate, the gums referred to are mixed, either separately or in suitable combinations; the following substances, pulverised meerschaum, paper pulp, calcined bones, fluorate of silica, sulphide or sulphuret of mercury, arsenic, or other metals, being first ground or pulverised to enable them to mix readily. Or they may also be mixed with the gums whilst they are in a state of fusiou; but the patentee prefers to incorporate them when in a state of solution. The mixture or incorporation of one or more of the two classes of substances having been effected, he then evaporates the whole to a thick paste, and when at a proper consistency, it may be rolled into moderately thick sheets, cut or manipulated into any form, or moulded in suitable matrices. When shaped or moulded, the new material is hardened by the application of heat, and will bear a very high polish. The patentee has found, in practice, that a good result has been obtained from the following preparations and combinations of ingredients—say, of amber, 12 oz.; kowrie, 3 oz., to be mixed together in solution, to which solution then add, and thoroughly mix with it, 7 oz. of meerschaum; the whole is then partially evaporated to a plastic state, and hardeued by heat. A good result is also obtained from the following ingredients and proportions—amber, 9 oz.; kowrie, 1 oz.; gum animi, ½ oz; and gum copal, 5 oz; these are dissolved as before, and mixed with 7 oz. of meerschaum, 1 oz. of paper pulp, and ½ oz. of the fluorate of silica. Or the paper pulp and fluorate of silica may be replaced by the same quantities of the chlorides of zinc, or half the quantity of cream of tartar; or 3 oz. of asbestos may be substituted for the chloride of zinc and cream of tartar. When bleached India-rubber or gutta percha is used in the above combinations, the patentee also proposes to add an equal quantity of sulphur. It will be obvious to the practical operator, that the nature and properties of this new substance may be greatly varied by suitably selecting the gums and other matters enumerated, and combining them in different proportions, with or without colouring matter; for example, if a coral-like substance be required, cochineal, carmine, or vermillion may be added, but the examples which the patentee has given above have produced the most favourable results. Amongst the most useful applications of this new material, may be enumerated the following: dental purposes, such as the manufacture of artificial palates and plates; photographic purposes, such as the working into sheets or tablets, also the formation of blocks for engraving and printing purposes, the manufacture of buttons, combs, brush handles, surgical and dental instruments and handles, pin and pencil holders or cases, cameos, medallions, and ornamental jewellery, musical instruments, the mouth-pieces and mounts of pipes, and similar applications.

VENTILATORS.

George Wemyss, *Roxburgh—Patent dated November* 3, 1859.

In carrying out this invention in practice, there is fitted up in the wall of the room to be ventilated, and by preference near the ceiling, an adjustable "gridiron" valve or slide, the face of which is flush with the inner face of the wall. This valve governs a passage into a metal chamber, which is fitted into a hole in the thickness of the wall, directly behind the valve. This metal chamber is double, the external section or division being solid and close, excepting where the adjustable door or valve opens into it from the apartment, and where a tubular thoroughfare opens from it on the opposite side to connect the apartment with the external atmosphere.

Fig. 1 of the accompanying engravings is a plan or external view of the ventilator complete, and fig 2 is an elevation of the inner end of the ventilator, showing the arrangement for controlling the egress of the heated air. The ventilating apparatus, as delineated in the accompanying figures, is arranged in the wall of the apartment in a horizontal direction so as to communicate from the interior of the room to the exterior of the building. The ventilator consists, at the outer or egress end, of a shallow box or recessed part, A, the flange of which is flush with the external wall. The box, A, has attached to it the plate, B, which is made smaller than the area of the box, so as to leave openings for the escape of the vitiated air. Extending behind the box, A, is a second chamber, C, communication between the two being effected by means of the openings made in the box, A. The interior of the chamber, C, is partly filled by the inner chamber, D, the sides of which are made with rectangular or other shaped openings in them. The chamber, D, communicates directly with the tubular passage, E, which in this modification is of a cylindrical figure in its transverse section. The tubular passage, E, is made in two parts, which are arranged on the telescopic principle, so that the length of the ventilator may be readily adjusted to the thickness of the wall. The inner end of the passage opens into a chamber, F, which is made with open sides similar to the chamber, D. The apertures in the chamber, E, communicate with the external box, G, the front part of which is made flush with the wall of the apartment. The apertures which are made in the front plate of the box, G, permit the vitiated air of the room to flow through, the outgoing current impinges against the closed end of the chamber, F, and passing round the end, it flows in by the lateral apertures. From the interior of the chamber, F, the vitiated air flows through the passage, E, into the chamber, D, and passes out by the openings in the sides to the chamber, C. Finally, the air passes through the openings in the chamber, C, and passing away under the plate, B, it escapes into the external atmosphere. In order to regulate the outgoing current of air, and prevent draught in the apartment, or the too rapid abstraction of warm air therefrom, a sliding plate, H, is fitted in the ventilator, so as to cover the apertures in the box, G, at pleasure. The sliding plate, H, is fitted in grooves or otherwise, so as to move easily behind the openings in the box, G. A horizontal slot is made in the front plate of the box, G, and through this opening a stud, I, works too and fro, which stud is fixed in the plate, H. A cord, J, or other suitable attachment is fastened to the stud, and passed through two pulleys, K, fixed in the face of the box, G. The ventilator when arranged for carrying off the heated and vitiated air from an apartment, is fitted in the wall near to the ceiling, and the ends of the cord, J, are carried downwards and brought within convenient reach, in the manner of an ordinary bell pull. With this arrangement of ventilator, the air as it becomes heated and impure flows off with more or less rapidity, according to the extent of the openings allowed in the box, G, by the sliding plate, H, all return draft being prevented by the arrangement of the chambers, D and F. These ventilators when fitted at the lower part of the room are well adapted for causing a current of cold or warm air to flow into the lower part, and as this air rises to the ceiling it carries away with it all the impure or vitiated air. In this way by a judicious arrangement of two or more of these ventilators, courts of law, lecture rooms, chapels, schools, stables, and other buildings, as well as dwelling houses or apartments, may be thoroughly and efficiently ventilated, and a constant supply of pure air ensured.

Fig. 1.

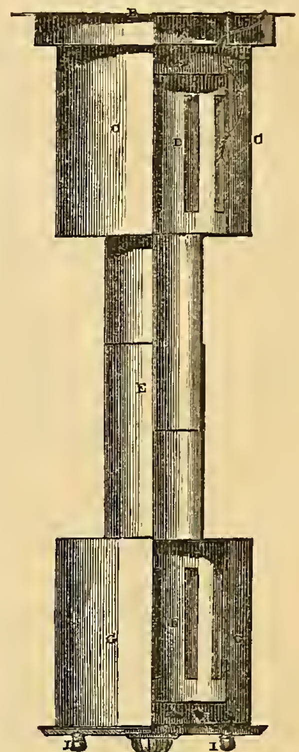


Fig. 2.

COLOURNIG AND VARNISHING INDIA-RUBBER.

N. S. Dodge, *London*, (H. L. Hall, *Massachusetts, U.S.*)—*Patent dated May* 23, 1859.

These improvements consist, first, in the sizing or preparing the surfaces of India-rubber goods, and similar waterproof manufactures, for the reception of varnishes and colours. The size employed may be composed of starchy, glutinous, albuminous, bituminous, resinous, or gummy substances. The patentee has found in practice, that common starch dissolved in water, answers as well as any other size. In some cases where economy is desired, the size may be combined with colour before its application to the surface of the material; but in the manufacture of goods of a higher class, the articles are first sized, and the colours or varnishes afterwards applied thereto, and dried in suitable drying chambers, the temperature being regulated to suit the particular varnish employed, ranging from 90° to 280° Fahrenheit. The improvements further consist in the preparatiou of a peculiar varnish for the class of goods referred to. According to one mode of preparation, linseed oil is boiled together with sulphur until the two substances are thoroughly combined, care being taken that the boiling process be not continued too long. A good result has been obtained from the following proportions: say 1 lb of flour of sulphur to one gallon of oil. Another varnish may be prepared by combining, say 4 lbs. of oxide of lead, 2 lbs. lamp black, 5 oz. of flour of sulphur, and 10 lbs. of India-rubber gum, with any suitable solvent, and boiling the mass iu a suitable vessel until the substances become dissolved and combined together in a liquid state; or if desired, India-rubber gum alone may be used, dissolved by boiling it in any well-known solvent applicable as a size, before applying colouring matter, or as a varnish or finish for the goods.

The sizing process and the varnishes, hereinbefore described, are particularly applicable to the manufacture of India-rubber, and similar waterproof fabrics, either as a waterproofing or finishing substance, whether such fabrics are prepared according to the processes of manufacture in ordinary use, or from waste vulcanised India-rubber.

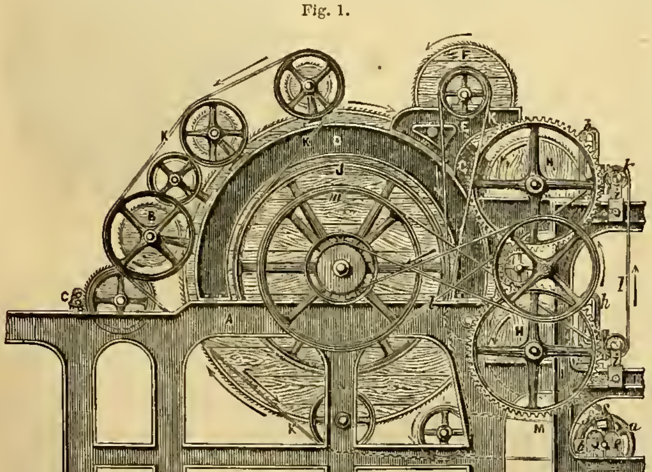
CARDING AND ROVING FIBROUS MATERIALS.

William Brown *and* Simeon Bathgate, *Selkirk.—Patent dated June* 14, 1859.

The improvements which Messrs. Brown and Bathgate have protected under these letters patent, refer to various mechanical arrangements to be used for carding and preparing wool and other fibrous materials.

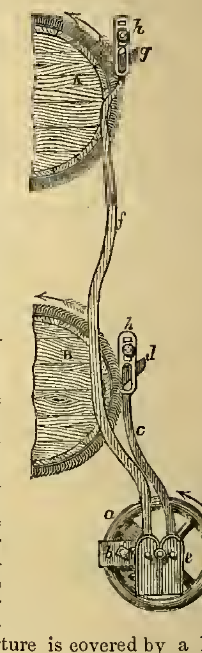
Fig. 1 is a longitudinal elevation of a carding engine or machine, having a portion of the patentee's improvements applied thereto. Fig. 2 is a sectional end elevation of the mechanical arrangement, for actuating the combs of a carding engine arrauged with two doffers. Fig. 3 is

Fig. 1.



a front elevation of a portion of the improved roving condenser, or apparatus for forming or arranging the fibres of the wool or other textile material uuder operation, into continuous rovings or cardings suitable for being slubbed or spun; fig. 4 is a plan of the apparatus corresponding to fig. 3. The first of these improvements is in the arrangement and construction of the rollers for gathering and feeding into the machine the wool or other fibrous materials to be carded. The framing, A, of the carding engine consists of the ordinary open panelled side frames or standards, which are counected by cross stay frames above and transversely to the side standards, and in immediate contiguity to the intake roller, B, are arranged two fluted iron feeding rollers, C. These rollers are arranged one above the other, slightly out of the perpendicular, so that both are at an equal distance from the teeth of the intake cylinder or roller, B; the fluted parts or teeth of the rollers take one into the other, and by their rotatory movement take up and carry forward the wool or other fibrous materials. At the parts immediately beyond the flutings the rollers, C, work in brass bushes which are fitted in binding straps; the extremities of these straps are screwed, and pass through laterally projecting lugs formed on the lower bushes. To the ends of the straps are fitted jam nuts, by means of which the bearings of the lower roller may be raised or lowered so as to adjust the position of the rollers relatively to each other, and the quantity of the fibrous material passing between them. The rollers, C, are made with long journals, on each of the outer ends of which is formed a collar or shoulder; the peripheries of these projecting parts coming in contact prevent the rollers from being brought too closely together. The two fluted rollers work together and at a uniform speed, by means of the brass pinions—the lower one of these pinions is keyed on the end of one of the rollers, C. Motion is communicated to the bottom roller, C, by spur gearing at the other side of the carding engine, or in any other convenient manner. The next improvement is the application of a shutter or plate applied to each side of the carding engine or machine, for the purpose of covering iu the triangular space or opening between the main cylinder and the "fancy" aud the doffer; the side standards, A, have bolted to them the "bends" or segmentally shaped frames, D, above which the periphery of the main carding cylinder extends. To the upper part of each bend is fixed a bracket, E, the two opposite brackets serving to carry the axle of the fancy, as the roller or cylinder, F, is technically designated. Immediately behind the brackets, E, and close to the ends of the rollers, are arranged the shutters or plates, G, which are fixed to the brackets, E, of the framing; these plates serve to prevent the admission of currents of air between the main cylinder, the fancy, F, and the upper doffer, H, as well as to prevent the current of air which is put in motion by the rotatory movement of the main cylinder and fancy from disarranging the wool or other fibrous materials, more particularly near the lateral extremities of the rollers. Each of the plates, G, has a circular aperture formed in it, to admit of the inspection of the working of the fancy—this aperture is covered by a loose swinging plate. In this way, whilst the same facility, as heretofore, is afforded for inspecting the working of carding engines, the arrangement of the plates, G, effectually prevent the derangemeut of the fibres and injury which arises from the unchecked circulatiou of the air. In constructing the frames of carding engines according to these improvements, as applied to finishing carding machines and condensers, the bends, D, have cast thereon or bolted to them brackets, iu which are fitted the beariugs for the axle of the upper doffer, H. Corresponding brackets are cast on the ends of the side standards, A, which support in like manner the lower doffer, H. Outside these brackets, and parallel thereto, are arranged the side frames, I, of the condenser or apparatus, by means of which the carded fibrous material is formed into rovings ready for being slubbed or otherwise prepared. These side frames, I, consist of vertical standards connected by horizontal rails, the upper and middle ones of which carry the condenser apparatus. The lower part of these side frames form a broad foot—a rib is formed on the under side of the foot, which fits into a corresponding groove in the sole plate of the machine. This arrangement of the side frames admits of the whole of the condenser apparatus beiug readily moved back from the doffers when required. In immediate connection with this part of the machinery is an improved arrangement for workiug the combs which take the wool or other fibrous materials off the doffers, H. The pulley, J, on the main cylinder shaft communicates motion by means of the endless belt, K, which, after passing round the pulleys of the principal cylinders or rollers, is carried round the pulley, L, fast to a horizoutal shaft, arranged at the lower part of the side frames, A. The pulley, L, by means of the belt, M, gives motion to the horizoutal shaft, which is arranged near the lower part of the side frames, I, and carried on bearings fixed to the cross frames which connect the side frames; on each end of this shaft is a fly-wheel, a; this part of the arraugement is shown separately in fig. 2. To each wheel, a, is attached a disc or plate,

Fig. 2.



b, which carries a crank stud fixed into the disc. This crank stud passes through a wooden bush, fitted in the forked extremity of the rod, *c*, which carries in its upper slotted end one of the comb bars, *d*, the other extremity of the bar being supported in a similar manner by the corresponding arrangement on the end of the horizontal shaft. To the extremity of the crank stud is fitted another plate or disc, *e*, which also carries a crank stud, passing through the bush of the rod, *f*, of the upper comb bar, *g*. With this arrangement, when the wheels, *a*, are put in motion, a rapid reciprocatory movement is imparted to each pair of the rods or arms, *c* and *f*, which carry the combs for taking off the wool from the doffers. The vertical movement of the combs is in opposite directions, the arrangement of the crank studs causing one comb bar to rise as the other is descending, and thus balance each other. The extremities of the comb arm studs work out through the vertical guides, *h*, on the rails of the side frames, I; these guides serve to maintain the vertical position of the guide studs for the comb bars during their elliptical reciprocatory traverse. As the wool or other fibrous material is removed from the band cards of the doffers, A and B, fig. 2, the slivers are formed into continuous rovings or cardings, by imparting a longitudinal twist to the fibres as the fleecy slivers come away from the doffers. The mechanical arrangement for effecting this compound operation of twisting and drawing is represented in front elevation and plan in the enlarged views, figs. 3 and 4. To the side frames, I, of the condenser apparatus is bolted the vertical bracket, *i*, there is one of these on the upper rail, and one on the second rail, contiguous to the doffers. Each bracket carries the bearings of a short horizontal shaft, *j*, figs. 3 and 4, on which is fitted a belt pulley *k*; this pulley as well as that belonging to the lower condenser apparatus, is driven by the belt, *l*, which derives its motion from the pulley, *m*, on the main cylinder shaft, fig. 1, the belt being crossed so as to drive both the pulleys in the proper direction. On the inner extremity of the shaft, *j*, is a small brass pinion, *n*, which is in gear with the main composite spur, and bevel driving wheel, *o*, by means of which motion is imparted to the whole of the wheels in the condenser apparatus. The wheel, *o*, is keyed to a tubular boss, *p*, which runs loosely on a stud projecting outwards from the carrying plate, *q*, which is bolted to the cross rail, *r*. The stud plate, *q*, like the others in the series, is made with a slot at the lower end, so as to admit of adjustment as regards height, to correspond with the driving shaft or pinion. The tubular boss, *p*, has also keyed to it behind the wheel, *o*, a second spur wheel, *s*, these two wheels drive the entire series of wheels in the condenser apparatus, and the amount of stretch or draw to be given to the wool or other fibrous material is regulated by adjusting the relative sizes of these wheels. Contiguous to the stud plate, *q*, is a similar plate, *t*, carrying the studs of the intermediate wheels, *u* and u^1; the centre of the back wheel, *u*, is eccentric to the wheel, u^1, in order that it may correspond and gear with the wheel, *s*, which is smaller than the composite wheel, *o*. The intermediate wheel, *u*, gives motion to the spur wheel, *v*, which

Fig. 3.

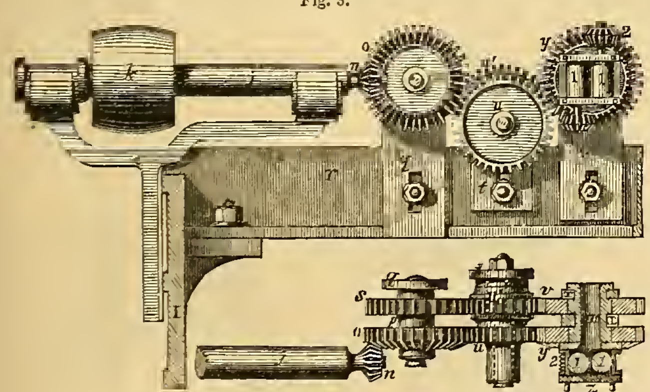


Fig. 4.

is fast to the trumpet mouthed sliver or roving tube, *w*, this tube is carried in the duplex forked ends of the bearing bracket, *x*, which is arranged parallel to the stud plate, *t*, and bolted to the rail, *r*. The roving tube, *w*, carries loosely on its front extremity, the composite spur and bevel wheel, *y*, and outside this wheel, but fast to the tube, the bearing plate, *z*, in the outwardly projecting parts of which are fitted the bearings for the drawing rollers, 1. The projecting cheeks of the bearing plate, *z*, are made with overhanging ends which form, v, edges to receive the grooved brasses, in which the spindles of the drawing rollers, 1, work. The spindle at one end of each drawing roller is prolonged outwards, so as to overhang the skew-bevel wheel, *y*. To these prolongations of the two rollers are keyed the brass skew-bevel wheels, 2, which gear with the bevel wheel, *y*, on the opposite sides of the bearing plates, *z*. This arrangement of the condenser apparatus, is repeated for as many rovings or cardings as are required to be formed, the motion of the first apparatus being communicated by means of the intermediate wheels to the second apparatus, and so on throughout the series. In this manner as the wheels, *v*, are driven by the intermediate wheels, *u*, the fibres of the wool or other material are twisted spirally, whilst at the same time, the composite spur and skew-bevel wheels, *y*, are driven by the intermediate wheels, u^1, which causes the wheels, 2, to rotate and so draw out the rovings by the rotatory movement of the rollers, 1. This compound mechanical arrangement accomplishes the operations of twisting and drawing the fibrous materials in a very superior and effective manner.

INSULATING TELEGRAPHIC WIRES.

Enoch Tomey, *Perth.—Patent dated November* 28, 1859.

The amazing extension of the electric telegraph, during the past few years, has called forth a vast number of appliances for the more effectually carrying out the connection of distant places by means of electric currents. The electric telegraph, although of so recent date, has proved of such pre-eminent utility, that if we were suddenly deprived of its assistance, our commercial transactions would for a time be suspended, and the effect would be felt far and wide. An important element in the practical construction of electric telegraphs is the mode of insulating the wires, so that the current may not be needlessly dissipated. This object Mr. Tomey effects in a very economical and efficient manner.

Fig. 1.

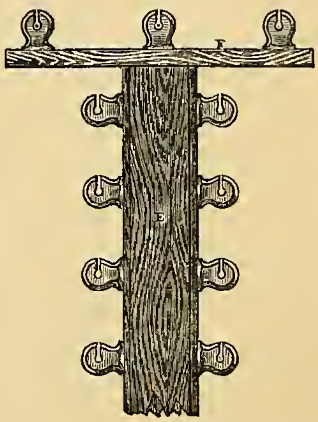


Fig. 1 of the accompanying engravings is an elevation of the upper part of a post for insulating a series of wires or conductors of the electric fluid, the insulators being arranged in vertical rows and on a laterally projecting branch. Fig. 2 is a front elevation of one of the insulators detached. In this modification the insulator is arranged for screwing into the lateral arms of a vertical post, similar to that shown in fig. 1. The insulators are formed either of glass, porcelain, ordinary earthenware glazed, or other suitable material; but preference is given to glass as being the best insulating material. The body, A, of the insulator consists of a flattened lump or mass of the material selected for its manufacture, to which a curved or partially elliptical figure is given. The edges of the insulator at B, are bevelled off, and at the lower part the material is curved outwards so as to form a good firm base. From the under side of this circular base a screwed stud or pin, C, extends, which serves to secure the insulator to the post or other support and firmly attach it thereto. A hole is made through the centre of the insulator, and from its upper part a slot or opening, D, extends downwards to this aperture. In this way the insulators have only to be screwed into the post, E or the laterally projecting arms, and the several wires or conductors simply slipped over the vertical slots down to the central retaining part. In lieu of the slot, D, a simple aperture may be made through each insulator, and the wire passed through it. Or the slot, D, may be formed in a diagonal direction, as shown by dotted lines in fig. 2. This arrangement while it admits of the telegraphic wire being as readily passed into it as in the vertical or horizontal modifications, yet from the diagonal direction given to the slot, D, the wire is prevented from springing out upon its being strained or vibrating with the wind. In some cases the patentee prefers to make the slot or opening, D, diagonal to the faces of the insulator, instead of being at right angles as shown in the figures. The object of the diagonal slot being to prevent the telegraphic wires from springing out of the insulators when strained. These insulators may be manufactured at a very cheap rate, and may be readily fixed in the posts or other supports, and they are easily replaced if broken, or shifted if their position requires to be altered.

Fig. 2.

COLOURS FOR DYEING AND PRINTING.

D. S. Price, *London.—Patent dated May* 25, 1859.

The colouring matters produced by the patentee, embrace shades of purple and pink. Three of these he names respectively, "violine," "purpurine," and "roseine;" and the manner in which they are prepared is as follows:—For the dark purple, or violine, take a suitable salt of aniline; the patentee prefers the sulphate, and describes the mode of operating with it. He takes one equivalent proportion (chemical) of aniline, two equivalents of sulphuric acid, Sp. Gr., 1850, and adds them to a convenient quantity of water—say about twenty parts to one of aniline. The mixture is then heated to nearly 212° Fahrenheit, and one equivalent of peroxide of lead added to it. The mixture is boiled for some time, and filtered whilst hot. The filtrate is of a dark purple hue, and contains the colouring matter, together with resinous matter, and a portion of sulphate of aniline. To obtain the pure colouring matter from this solution, add to it an excess of caustic alkali, and submit it to distillation, until the whole, or nearly the whole of the aniline has been redeemed. The contents of the still are then filtered, and the residue left upon the filter is slightly washed with water, and allowed to drain. To purify this precipitate, which consists of impure colouring matter, it is boiled with water slightly acidulated with tartaric acid, until no more colouring matter is dissolved, when the greater part of the impurities remain undissolved. The impurities are then separated by filtration, and the filtrate concentrated by boiling to a small volume. During evaporation a further amount of resinous matter separates. The liquor is then filtered, and may be used for dyeing purposes.

To prepare purpurine, take two equivalents of aniline, two equivalents of sulphuric acid, Sp. Gr., 1850, and dissolve them in about twenty parts of water, and raise the temperature of the solution to the boiling point, and then add to it one equivalent of peroxide of lead. The mixture is then boiled. The patentee has found in practice that from one to two hours is sufficient for this purpose. Then filter the purple coloured solution whilst hot, and allow it to stand until cold. Upon cooling, a portion of the colouring matter separates in a flocculent form; collect this precipitate, slightly wash it with water, and allow it to drain. Boil it with water, slightly acidulated with tartaric acid, and complete the purification as has been described for violine. The filtrate from the flocculent precipitate before-mentioned is rendered alkaline by the addition of caustic potash or soda, and distilled until the whole, or nearly the whole, of the aniline has been redeemed. The residue left in the still is collected on a filter, and treated in the manner already described.

To prepare roseine, take one equivalent of aniline, one equivalent of sulphuric acid, Sp. Gr., 1850, and dissolve them in about twenty parts of water; raise the temperature of the solution to the boiling point, and add to it two equivalents of peroxide of lead, and keep the mixture boiling for a short time. Then filter the rose-coloured solution, concentrate it by boiling to separate the resinous impurities which precipitate, and filter. The filtrate is a solution of the colouring matter fit for dyeing purposes. In the formation of this colouring matter nearly the whole of the aniline is acted upon. In the whole of these processes the patentee prefers to add the peroxide of lead in a moist and finely divided state.

In order to obtain the colouring matters in a solid form, take the solutions, purified as described, and precipitate them by the excess of caustic alkali, collect the precipitate, allow it to drain free from the mother liquor, and dry it at a temperature not exceeding 212° Fahrenheit. It will be understood that by modifying the above proportions, colouring matters of different shades may be obtained. It will be obvious that when other acids, the lead salts of which are soluble, are employed in the place of sulphuric acid, the process of purification will require to be modified. In the purification of violine and purpurine, a considerable quantity of aniline is evolved during the ebullition of the mixture of the sulphate of aniline and peroxide of lead, it is therefore preferred to conduct the operation in a still or suitable vessel, which enables the operator to collect the aniline. The patentee does not limit his invention to the use of salts of aniline alone, as the salt of the other bases or mixtures of the same, produce colouring matters when treated in the manner before described.

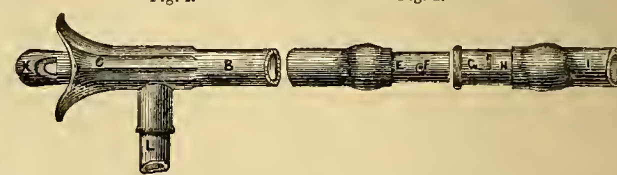
RAILWAY SIGNALS.

A. L. Dowie, *Glasgow.—Patent dated November* 7, 1859.

The highly important desideratum of an effective yet simple means of communication between the officials in charge of railway trains, as well as the passengers, has been dealt with by a legion of inventors, but with little practical effect. Railway directors have hitherto shown but little favour and scant courtesy towards the patentees of signalling apparatus. We trust, however, that the propriety of adopting some means of communication between the passengers and the guard will, ere long, be recognised, the necessity of which has been so frequently and painfully made evident. Mr. Dowie's mode of signalling, to which we now direct attention, is upon the pneumatic principle, and it has one very important point in its favour—inexpensiveness.

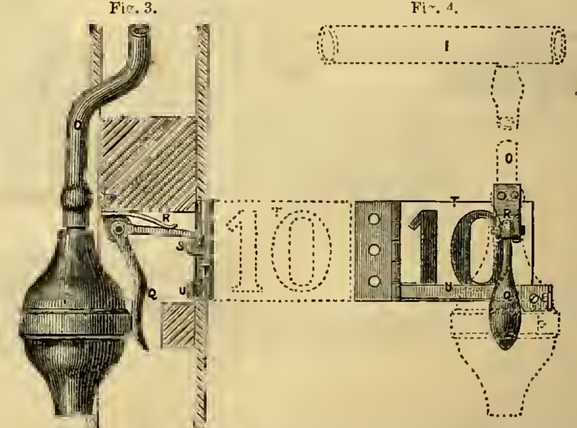
Fig. 1 is an elevation of the mouth piece and whistle end of the signalling apparatus; fig. 2 is an elevation showing the mode of connecting the ends to adjacent tubes; fig. 3 is a partially sectional elevation showing the arrangement for enabling passengers to communicate signals to the guard; fig. 4 is an elevation taken at right angles to fig. 3, to show the arrangement for indicating the particular carriage from which the signal has been made, by means of a visible indicator. According to the modification delineated in the accompanying engravings, the apparatus is arranged so that the guard is enabled to communicate either moderate or powerful signals to the engine driver, or the signal tubes may be used by either of the officials as a means of verbal communication. The passengers in the several carriages are also provided with the means of communicating instantly with the guard, when from any emergency it is necessary to attract his attention. The apparatus, as arranged in the break or guard's van, consists of a tube, B, by preference formed of gutta-percha; this tube terminates at one extremity in a mouth-piece, C,

Fig. 1. Fig. 2.



which is fitted so as to be within convenient reach for use as a speaking tube. The other portion of the tube is carried upwards, and passes out at the side of the van beneath the overhanging part of the roof, the extremity of the tube, B, projecting outwards just beyond the end of the van. To the projecting end of the tube, B, is secured a piece of vulcanized India-rubber tubing; this material is chosen on account of its elasticity, which admits of the carriages being drawn apart to the utmost extent, without interfering with the continuity of the signalling tube. The free extremity of the India-rubber tube has fitted to it a metal ring, E, which has a stud, F, projecting from its periphery, to admit of its attachment to the end of the adjoining tube. The stud, F, is passed into the slot, G, of the ring, H, and is turned partially round in the right angled portion of the slot, thus forming a bayonet joint, which is very easily attached and detached, and is at the same time secure when put together. The ring, H, is fast to the end of the tube, I, which is by preference formed of gutta-percha, it is carried along the side of the carriage under the projecting eave of the roof and is fastened thereto. The free extremity of the tube, I, has attached to it a length of India-rubber tubing, J, similar to the arrangement before described, for the purpose of attaching it to the neighbouring carriage. In this way the tubes are connected and continued throughout the train until they join the signalling tube on the engine, which tube is provided with a mouth-piece, C, and whistle, K. Ordinary signals may be passed between the engine driver and the guard, either by means of the whistle—a simple succession of sounds being arranged to form a code of signals—or the

Fig. 3. Fig. 4.



tubes may be used to convey short verbal instructions. Where, however, a more powerful signal is required, as upon a sudden emergency or accident occurring, the whistle is then caused to sound with increased loudness, by means of a bellows arranged beneath the seat of the van, and actuated by a hand lever. The tube, B, is made with a laterally projecting branch, the end of the tube being left free, this part is readily fitted into a stationary vertical tube, which is fixed to the side of the van. The tube passes down through the seat of the van and enters the bellows, which is arranged beneath and fastened at the upper part to the under side of the seat. To the lower part of the bellows is fitted a wooden bottom, with the usual valve opening internally—in the sides of this bottom piece are fixed two vertical rods, which are connected at the top by a cross head. This cross head is connected by a link to a hand lever, which is centred upon a stud projecting from the side of the van; by working this lever in the manner of a pump, a considerable body of air is immediately propelled through the signalling tubes. Under ordinary circumstances the lateral branch of the tube, B, is intended to be kept closed by means of a plug, and the whistle retained in the mouth-piece, so that a signal from the engine end of the train may be at once heard. But when the bellows is required, the plug is removed from the lateral branch and slipped into the mouth piece end, so as to stop the emission of air in that direction; the extremity of the lateral branch is slipped on to the end of the stationary vertical tube and the connection is instantly made, or the application of the finger to the whistle will serve the same purpose. The arrangement for the ready operating of the bellows admits of a very powerful whistle being used in conjunction with the signalling apparatus on the engine, so that the attention of the driver cannot fail to be drawn to it when required. The means provided for enabling the passengers to give signals is shown in fig. 3. From the tube, I, which passes along the several carriages of the train, a lateral branch, O, is carried into each compartment of the carriage; this tube is carried downwards a short distance, and terminates in an air vessel or ball, P, which is partially sunk in an opening made in the wood work or lining of the carriage. The simple pressure of the hand against the ball, P, causes a sufficient quantity of air to be forced through the signalling tubes to sound the whistle in the break van and tender, and so attract the guard's and driver's attention. And in order that they may readily know the carriage from whence the signal has been given, a visible signal or indicator is actuated simultaneously with the operating of the whistle. The back part of the air vessel or ball, P, where it projects through the lining of the carriage, presses against the pendent end of a bell-crank catch, Q, which is jointed to a small bracket piece fastened to the wood work of the carriage. The upper face of the horizontal arm of the catch, Q, is pressed downwards by the blade spring, R, which causes the free extremity of the catch to retain its hold on the nib, S, of the numeral indicator, T. This indicator, T, is hinged to, and sunk or let into the outside part of the carriage. Under ordinary circumstances the indicator is shut to against the side of the carriage, and serves as the ordinary number of the carriage. But upon a signal being made by a passenger, the compression of the air vessel against the arm of the catch, Q, releases it from the nib, S, on the inside of the indicator, T, and the indicator instantly moves outwards at right angles to the side of the carriage. This outward movement of the indicator is effected by the pressure of the blade spring, U, against the back of it; this spring is screwed to the framing and panelling of the carriage The attention of the guard being attracted by the audible signal, by looking along the train, he is at once enabled to proceed to the proper carriage and ascertain the cause for giving an alarm. These visible signals may also be arranged and coloured so as to be readily observed by the guard or driver during the night. In order to admit of the carriages being reversed without interfering with the attachment of the signalling tubes, the carriages may be fitted with tubes on each side, care being taken to reverse the arrangement of the India-rubber connecting tubes. In this way, whether the carriages move in one direction or the other, the same facility is afforded for readily connecting the signalling apparatus from one end of the train to the other.

LAW REPORTS OF PATENT CASES.

GAS: HILLS *v.* THE LONDON GAS LIGHT COMPANY.—This was a suit in the Vice-Chancellor's Court, before Vice-Chancellor Sir W. P. Wood; and it was instituted by Mr. Frank Clark Hills, of Deptford, the well-known manufacturing chemist, against the London Gas Light Company, for an injunction to restrain their alleged infringement of Mr. Hills's letters patent of the 28th of November, 1849, granted for an invention which (as modified by subsequent disclaimer) is entitled "An improved mode of manufacturing gas." Under these letters patent, Mr. Hills, in his specification, claims —first, the purifying coal gas from sulphuretted hydrogen, cyanogen, and more or less perfectly from ammonia, by passing it through the precipitated or hydrated oxides of iron, or the subsulphates or oxychlorides of iron, from whatever source obtained, and either by themselves or made into a more porous material, by being absorbed into or mixed with sawdust or breeze, or other material; and, secondly, the repeatedly renovating or re-oxidizing the purifying materials by the action of the air, whenever they cease to absorb sulphuretted hydrogen, so that they may be used over and over again to purify the gas; with a third claim, which is not material. Mr. Hills's letters patent have been the subject of repeated and protracted litigation; the most important being that which has taken place at law between the present parties, and which has been several times reported in these columns. From the statements in the bill of complaint and affidavits in this suit, it appeared that on the 30th of June, 1856, Mr. Hills commenced an action in the Court of Exchequer against the defendants for an infringement of his letters patent. This action came on for trial at the sittings after Michaelmas term in the same year, when, at the end of the second day of trial, the plaintiff was nonsuited. A rule *nisi*, however, was obtained to set aside the nonsuit; and this rule, after argument, was ultimately, in November, 1857, made absolute for a new trial. A new trial was had accordingly at the Guildford summer assizes, 1858. This trial lasted five days, and resulted in a verdict for the plaintiff upon all the issues, leave being reserved to the defendants to move on several points of law. The defendants afterwards moved for and obtained a rule *nisi*, calling on the plaintiff to show cause why the verdict should not be set aside and a verdict for the defendants, or a nonsuit, entered; or why a new trial should not be had. The argument of this rule occupied the Court of Exchequer seven days, and ultimately, on the 25th of February, 1860, the Court gave judgment and discharged the rule. The effect was to establish Mr. Hills's patent against the defendants, so far as the Court of Exchequer was concerned, and the plaintiff signed final judgment in the action. The defendants, however, are about to appeal on the points of law involved to the Court of Exchequer Chamber, under the right of appeal given by the Common Law Procedure Act of 1854. The plaintiff in the meantime has filed his bill of complaint in the present suit, praying for the usual injunction, and account in respect of the defendants' infringement of his letters patent. The defendants admitted that they had infringed Mr. Hills's letters patent, if valid; but contended that for some time past they had adopted exclusively the use of a process which was different from that of the plaintiff, and was a process patented by Mr. Frederick John Evans by letters patent of the 28th of August, 1858, for an invention entitled "An improvement applicable to gas-purifying." Mr. Rolt, Q.C., and Mr. Marten now moved for an injunction, in the terms of the prayer of the Bill, to restrain the defendants, their agents, servants, and workmen, from manufacturing and purifying gas according to or in imitation of the invention of the plaintiff; and also from using, vending, or selling gas so manufactured or purified; and, generally, from infringing the plaintiff's letters patent and invention. They contended that, without entering into the question of the validity of Mr. Evan's patent, in the present stage of the litigation, the plaintiff was entitled to an injunction preceding the appeal at law, on the ground that there was a final judgment at law in the plaintiffs' favour, and that there had, at any rate, until recently been an infringement by the defendants of the plaintiff's letters patent. Sir Hugh Cairns, Q.C., the Hon. George Denman (of the common law bar) and Mr. Bruce appeared for the defendants. The Vice-Chancellor, at the conclusion of the opening of the case for the plaintiff, suggested the minutes of an order, which were adopted, as follows:—The defendants' company, by Mr. Daniel Sprague, a director and the deputy governor of the company, to give an undertaking, in the terms of the notice of motion, not to infringe the plaintiff's letters patent; the defendants to be at liberty to continue the use of the process described in Mr. Evans's specification, without prejudice to any question as to their right to use such process; the defendants, by Mr. Sprague, undertaking to keep an account in respect of the process used by them, and to allow the plaintiff to enter and inspect their works at all reasonable times; the motion to stand over until the hearing of the appeal at law, with liberty to the plaintiff either to bring on the motion again, on the ground of the process actually in use by the defendants being an infringement of the plaintiff's letters patent, or to bring such action at law as he might be advised, to try that question. The learned Vice-Chancellor said that his reason for making the suggestion was that he should have felt no hesitation in granting the injunction, if the defendants would not give the required undertaking. The plaintiff was entitled to this by the judgment at law, and it was also to be considered that the letters patent had only three or four years to run, so that time was of great importance to the plaintiff. But the undertaking being given, and the defendants alleging that there was a *bonâ fide* distinction between the process now in use by them and the plaintiff's patent process, this question would be better tried by direct proceedings than upon a motion to commit for breach of an injunction against the infringement of the plaintiff's letters patent.

TRADE MARKS: MAPPIN *v.* MAPPIN.—This was a motion in the Vice-Chancellor's Court, before Sir W. P. Wood, for an injunction to restrain the defendants, John Newton Mappin and George Webb, from representing that the business carried on by them at their establishment, 78 and 79 Oxford Street, has any connection with the business lately carried on by the plaintiffs and their partners, and now carried on by them at their establishment in King William Street, City, and that the defendants might also be restrained from infringing or imitating the trademark of the plaintiffs, and from imitating, &c., the advertisements used by the plaintiffs as the firm of "Mappin Brothers." The plaintiffs had for some years carried on the business of cutlers, electro-silver platers, and manufacturers of Sheffield goods, both in King William Street, City, also at the "Queen's Cutlery Works," Sheffield. The defendant, John Newton Mappin, was taken into partnership with the plaintiffs, his brothers, upon his attaining 21, and a deed of partnership was executed between them on the 1st of January, 1857. On the 10th of October, 1859, a deed was executed for the purpose of carrying out the terms upon which the partnership should be dissolved, the plaintiffs having become the purchasers of the partnership property and good will, together with the exclusive right to use the style or firm of "Mappin Brothers," under which the business had been carried on. The defendant, J. N. Mappin, the retiring partner, had formed a partnership with the defendant, George Webb, under the style of "Mappin and Co., and on the 16th of April last they opened a shop at 77 and 78 Oxford Street, opposite the Pantheon. They had also taken premises at Sheffield for manufacturing purposes, which were at first called "King's Cutlery Works," and since, "Royal Cutlery Works." The plaintiffs by their bill alleged various acts of the defendants in the trade-marks used by them, the advertisements issued, the style assumed, &c., as being calculated to produce an impression that their establishment in Oxford Street was a branch of, or identical with the original establishment of "Mappin Brothers," and thereby divert custom from the plaintiffs, and the benefit of the good will purchased by them.

The case of the defendants was not entered into, but it may be mentioned that they had altered the form of their advertisements from that originally issued, and expressly stated that they had no connection with any house of a similar character in London.

The Vice-Chancellor in refusing the motion, said that he would advert to a few of the difficulties in the way of the plaintiffs which rendered the present case different from almost all those in which a similar contest had been raised. In the first place, it was not intended that any one of the brothers composing the original firm should not be at liberty to use the name of "Mappin." So long as the retiring partner stopped short of representing himself as continuing or identical with the original firm, he was quite at liberty to use the name of "Mappin." The plaintiffs, therefore, were not entitled to say that there was any fraud in the use by the defendant of that name, or in his making it conspicuous. The case was entirely different in this respect from those which had been cited, where some obscure individual with the identical name had been bought for the purpose of giving the old title to the new firm. Then, was there anything to suggest to the public that the defendant was continuing the original business? If the name of Mappin had become celebrated in the cutlery trade, there was no reason why the defendant should be bound to advertise the name of his new partner also, and thus give him all the advantage to be derived from the association of his name with that of "Mappin." In the case of a dissolution the defendant might be unwilling that his partner should have an equal advantage (as to the name) with himself. Very plausible reasons, therefore, might be suggested for the use of the style of "Mappin and Co.," instead of "Mappin and Webb." His Honour then proceeded to the consideration of how far the course taken by the defendants in their advertisements, &c., had been *bonâ fide*, and observed that although their were some points which might require explanation if the cause came to a hearing, the defendants must be acquitted of having acted otherwise than *bonâ fide*. It was not proved that any single person had been deceived by advertisements or representations made by the defendants in their shop. The motion must therefore be refused, and the costs would be costs in the cause.

Steam Music: Denny *v.* Mars.—This was a motion in the Vice-Chancellor's Court, before Sir W. P. Wood, for an injunction to restrain the defendant, Mars, more commonly known as "Jim Myers," from exhibiting and using a steam musical instrument called the "Calliope," in infringement of the plaintiff's patent rights. The plaintiff was the asignee of an English patent granted in 1856, for a musical instrument to be played by the agency of steam, or highly compressed air. The patent was in the first instance assigned to "the Steam Music Company" of Worcester, in the State of Massachusetts, and by the company to the plaintiffs in January, 1860. Since the assignment to them the plaintiffs had been engaged in manufacturing instruments according to the patent, and had entered into a contract with the proprietor of Cremorne to supply him with one of those instruments which bore the name of "calliope." The defendant was the proprietor of "Jim Myers's Great American Circus," and had issued the following advertisement at Wolverhampton:—

"Mr. Myers, feeling the importance of encouraging mechanical skill, and being desirous of giving the public new novelties every season, has on this his second tour through England imported from America, at the immense expense of £5000, one of the most scientific wonders of the day—the Great Steam Musical Calliope, being the only instrument of the kind ever travelled in Europe. This wonderful invention represents a full brass band of 100 musicians, and has attached to it a steam engine of 20 horse-power, which constantly keeps the valves of the calliope filled with steam; and although possessing the power of a double orchestra, and can be heard at a distance of five miles, yet it can be played by a lady or gentlemen with as much facility as the piano-forte. A grand procession will be made every day at one o'clock, headed by the steam musical calliope."

It appeared that there was an American patent for these enormous instruments, which had become vested in the Steam Music Company, and that one of the American "calliopes" had been supplied by them in 1857 to a person named Nixon, from whom the defendant had hired it for exhibition in England. The plaintiffs' case, however, was, that Nixon was limited in his use of the machine to five states of America only, and that the defendant had acquired no right to use the invention in England in breach of the exclusive rights vested in the plaintiffs under their assignment. They also alleged that the instrument announced for exhibition by the defendant was in a disabled and imperfect condition, and contained defects which had been obviated in those manufactured by the plaintiffs under the English patent, so that the reputation of their "calliope," the *debut* of which at Cremorne had been announced, would suffer serious injury by the previous appearance under circumstances of distress of one of her American cousins. The plaintiffs had obtained an *interim* order restraining the exhibition advertised to take place at Wolverhampton. They now moved to continue the injunction.

The Vice-Chancellor intimated that it was not a case for an injunction, as the defendant claimed under a title acquired two years before that of the plaintiffs, from the persons who had assigned to the plaintiffs. At the same time, as there might be a question to be tried, he thought that there must be some undertaking by the defendant as to keeping an account.

For the defendant it was contended that the case was too vague for the Court to make any order upon, and that the motion ought to be dismissed with costs. There was nothing to show that the defendant was not fully entitled to use the instrument in England, and, further, the plaintiffs knew three or four months back that the defendant was going to exhibit it, and had taken no steps until the very last moment.

His Honour said that there would be no injunction, but there was some question for trial as to the exact nature of the agreement under which the instrument got into the hands of Nixon. It was quite clear that the company when they were owners of the patent, might sell the instrument in England or elsewhere. He should not, therefore extend the *interim* order. The costs of this motion would be costs in the cause, and the defendant must undertake to keep an account of the receipts at his various exhibitions with or without the instrument. His Honour also observed that he could not accede to the suggestion that the plaintiffs would be irreparably damaged at Cremorne Gardens by the exhibition of an imperfect instrument by the defendant at Birmingham.

Atmospheric Holders: Walton *v.* Lavater.—This was an action in the Court of Common Pleas, before Lord Chief Justice Erle and Justices Byles and Keating; and the previous proceedings in the matter have already been reported in the *Practical Mechanic's Journal*. The action was brought for the infringement of a patent for the adaptation of atmospheric pressure to the purposes of holding and supporting in various ways, and the cause originally came before Mr. Justice Byles, when a verdict was found for the plaintiff. A rule was subsequently obtained for a new trial on the grounds of misdirection, and that the verdict was against evidence.

Mr. Hindmarch showed cause against the rule, and Mr. Webster was heard in support of it.

The defendant is the inventor of a pneumatic plateholder, used by photographists. By the application of a round patch of India-rubber as a sucker, and a screw fastened to the centre through a holder, the centre is withdrawn, and, creating a vacuum, a plate of glass is firmly held. The defendant assigned one moiety of his patent to the plaintiff. He subsequently sold the other moiety to Mr. Dodge, who assigned that moiety also to the plaintiff. The defendant manufactures in France a novel application of the same principle which he calls "pneumatic brackets," or a holder and sucker to attach to a wall or any smooth substance, the holder having sockets attached in which candlestick branches can be placed, or it can be used as a hat peg. These the defendant imported and sold in this country, and for this alleged infringement of the plaintiff's patent the present action was brought.

The Chief Justice, in giving judgment, said he was of opinion that the rule ought to be discharged. The first ground on which the rule had been moved for was that the patent was not vested in the plaintiff, and that he was not entitled to maintain an action. The patent had been assigned as to a moiety to the plaintiff by the defendant; and as to the other moiety the defendant had assigned it to Dodge, who had assigned it to the plaintiff, and both moieties were vested in the plaintiff at the time when this action occurred. It was contended by Mr. Webster that the grant of a patent was an indivisible franchise, and that the assignee took only a licence, and had a right to an account of profits, but that the whole of the original franchise remained in the original patentee, and that even although, as in the present case, the whole patent was assigned to him, he was yet an imperfect owner, having an equitable right to the profits only. He (the Chief Justice) could not think that it could be established that the legal owner had not the whole legal right. He considered that the 15th and 16th of Victoria, cap. 83, sect. 35, incidentally recognised the passing of an interest in a patent, and provided that assignments of it should be registered; and, although it by no means directly enacted this, yet this effect was contemplated by the Legislature. The 26th section also said that a patent might be assigned to a larger number than 12 persons, which was the former law. Mr. Webster contended that assignees were all to take, as joint tenants, which imported survivorship, while commercially they would take separate interests. Such a state of the law would be very inconvenient, and it seemed to him that that argument failed. The defendant had assigned both the moieties, and he thought the cause of action vested in the plaintiff, if there was an infringement of the patent. It was next contended that there had been no infringement by the defendant, because he had only sold the articles which were imported from abroad. He had heard the arguments of the counsel on both sides as to the expressions in the original grant relating to patents, giving the exclusive privilege to the patentee to "make, use, exercise, and vend," the defendant's counsel contending that the defendant had not come within these words, the word "vend" being only in the reciting part of the grant; but it appeared to him (the Chief Justice) to have been clearly the intention of the grant or privilege to prohibit the use of the patented article by selling, which was the main profit of a patentee. It seemed to him that selling a patented article for profit would be good evidence that the seller had "used" the patent. And with respect to the defendant not being liable for selling the articles patented because they were imported from abroad, he should say if that were simply the case it was sufficient to charge the party with infringing if he had imported and sold. But it was not necessary to lay that down in the present case, because the defendant had a full knowledge of the patent, and the article sold was not made by another manufacturer and imported, but was manufactured by himself in France, and stamped with his own name. That was good evidence that he caused the article to be made in France, and knowingly imported it in violation of his patent, which he had sold to the plaintiff. It was then contended that the patent did not extend to the article sold, which was called a plate-holder in the patent, and by Mr. Webster, a peg. Between the plaintiff and the defendant he (the Chief Justice) was of opinion that the defendant could not raise the question that the patent was void for want of novelty, the pneumatic principle having been before known and applied. Looking at the specification and disclaimer according to Mr. Webster, the patent was intended to give up Bolton's plate-holder, and to be confined to pneumatic instruments, pegs with accessaries, rings, hooks, &c., and was a patent for applying accessaries to a pneumatic instrument. He (the Lord Chief Justice) was of opinion that it was not a patent for adding these accessaries to such an instrument, but was a patent to cause pegs to adhere to solid surfaces by the application of the pneumatic principle. The rule must therefore be discharged.

The other learned Judges concurred.—Rule discharged.

Seyssell Asphalt: Farrell *v.* Broughton.—This was a motion in the Vice-Chancellor's Court, before Sir R. T. Kindersley, or an injunction to restrain the defendant, his agents, or workman, from selling asphalt made into blocks resembling those manufactured by the plaintiffs, having the word "Seyssell" impressed upon them, and having a colourable imitation of those manufactured by the plaintiff. The bill also asked for an account and for an order that the plaintiff might be at liberty to examine the blocks manufactured by the defendant. It appeared that the Asphalt Company, now represented by the plaintiff as their secretary, was established in 1838, an Act of Parliament also enabling them to purchase Claridge's patent for making asphalt, from whom they had obtained a license. The company had for many years imported masses of bituminous limestone from a mine at Pyrimant, near the town of Seyssell, in France, in the department de L'Ain, near Geneva, except for a period of two years, when the French Asphalt Company, through whom they obtained it, did not carry on business, when they got it from the Val de Travers. When brought to this country it was ground down, mixed with tar and sand, and made up into blocks, on two sides of which the words "Seyssell" simply was imprinted. In March last they alleged that they had discovered that the defendant, who was a general dealer in asphalt, at Battersea, was manufacturing and selling a spurious material under the name of asphalt, formed of gas and other tars, plaster of Paris, chalk, and rubbish, and that at the end of April last, happening to be at Waterloo-station, the plaintiff saw such blocks, and upon inquiry, was told that the defendant had contracted to lay down 35,000 feet as a covering to the arches of the company. The plaintiff also alleged that the defendant had been pressed by the engineer of the South-Western Company, to prove that the blocks were genuine Seyssell asphalt, and in consequence had procured blocks of Seyssell asphalt from the defendant's company, who had in consequence been proceeded against by the plaintiff's company, and had withdrawn their license to the defendant. The defendant, it was alleged, had also supplied large quantities to the works at the new Grosvenor Hotel, now constructing at Pimlico.

For the defendant, it was contended that the word "Seyssell" imprinted on the block did not constitute a trade mark. The plaintiffs must first establish their legal right, which they had, in fact, abandoned, inasmuch as their new label added the word "Pyriment." All the asphalt supplied to the South-Western Railway Company and to the Grosvenor Hotel had been used, and the word "Seyssell," which was impressed without any orders as to size of character, was merely to distinguish it as brought from that place.

The Vice-Chancellor said that the sole question was, whether the plaintiffs had an exclusive right to the use of the word "Seyssell," as used by them. Inasmuch as all this Court had to do was to protect legal rights, if there was a reasonable question whether the right existed, that must be determined by a court of law. Where it was plain it did exist, as by a legal proceeding upon an alleged infringement of a patent, or where it was admitted, the Court would at once grant an injunction, but in the absence of such an established right, a court of equity would not interfere. His Honour in the course of the argument had imbibed certain impressions, but he abstained from expressing them, lest he might prejudice the case, because he thought the plaintiffs ought to be left to their legal remedy upon the question whether this was such a trade mark as a court of law would give damages in consequence of the use of by any other persons. An account must be kept in the meantime in the terms of the injunction, and the motion must stand over.

Spinning Machinery: Potter *v.* Parr, Curtis and Madeley.—This was an action in the Court of Queen's Bench, before Lord Chief Justice Cockburn, Mr. Justice Crompton, and Mr. Justice Blackburn, and by it the plaintiff, James Potter, sought to recover damages for the infringement of two patents granted to him in the years 1836 and 1842, for "certain improvements in spinning machinery," relating to what is called "the winding-on motion." The defendants, Messrs. Parr, Curtis, and Madeley, are manufacturers of machinery at Manchester. This action against them was tried before Lord Chief Justice Cockburn at Guildhall, when the plaintiff obtained a verdict; but leave was given to the defendants to move to enter a verdict in their favour, or a nonsuit, and, subsequently, a rule was granted for a new trial. The defendants contended that as to the count upon the one patent there was no evidence of infringement; and as to the other patent, they contended it was bad upon its face.

Lord Chief Justice Cockburn said he was of opinion that the rule to enter the verdict for the defendants ought to be made absolute. The plaintiff's second patent of 1842 was bad for claiming more than he was entitled to claim. The plaintiff was not entitled to claim what he had specified in his patent of 1836, and so made known to the world, and as there was no novelty in his alleged improvements in his second patent the whole of that patent fell to the ground for want of novelty. With respect to the first patent, that of 1836, his lordship thought there was no evidence of infringement. If there was any infringement at all it was of the patent of 1842, and the plaintiffs sought to show that the defendants had infringed that patent by the substitution of certain mechanical equivalents; but his lordship thought there had been no infringement.

Mr. Justice Crompton and Mr. Justice Blackburn were of the same opinion.

Rule absolute to enter the verdict for the defendants.

Coating Iron Ships: Bickford *v.* Binning.—This was an action in the Court of Queen's Bench before Lord Chief Justice Cockburn, and Justices Wightman, Crompton, and Blackburn; and it was brought for the infringement of the plaintiff's patent for protecting iron ships and vessels from corrosion, and animal and vegetable matters, by coating them first with black varnish, and then with asphalt. The jury found a verdict for the defendant, but the Court subsequently granted a rule for a new trial, upon the ground of surprise. Mr. Bovill, Q.C., Mr. Hawkins, Q.C., and Mr. Murray, showed cause against the rule, which was supported by Mr. Knowles, Q.C. (with whom were Mr. Serjeant Petersdorff and Mr. Webster). After a long argument, the Court expressed a wish to suspend their decision until after one of the questions involved in the case had been determined in another action pending.

Sewing Machines: Foxwell *v.* Thomas.—This oft-disputed question was, in the present case, in the Court of Common Pleas, before Lord Chief Justice Erle, Mr. Justice Willis, Mr. Justice Byles, and Mr. Justice Keating, when Mr. Manisty moved to set aside a nonsuit and for a new trial. The action was for the infringement of a patent for improvements in sewing machines, and was tried before Mr. Justice Blackburn at the Liverpool assizes. The jury found that the needle, shuttle, and serrated plate moving from one centre were the same in the defendant's machine as in the plaintiff's, but that there was an improvement in the defendant's machine, and that his arrangement was substantially different from that of the plaintiff's machine. The learned counsel contended that the learned judge ought to have directed the verdict to be entered for the plaintiff.

The Court granted a rule *nisi*, reserving leave to the defendant to make the objections raised at the trial, upon showing cause against this rule.

P

Carriage Windows: Oxley *v.* Holden.—This was an action in the Court of Common Pleas, at Westminster, before Lord Chief Justice Erle and Justices Williams, Willis, and Byles, for the infringement of a patent for certain improvements in carriage doors and windows.

The Court, in giving judgment, said that the objections to the validity of the patent failed, and, therefore, the rule must be discharged.—Rule discharged.

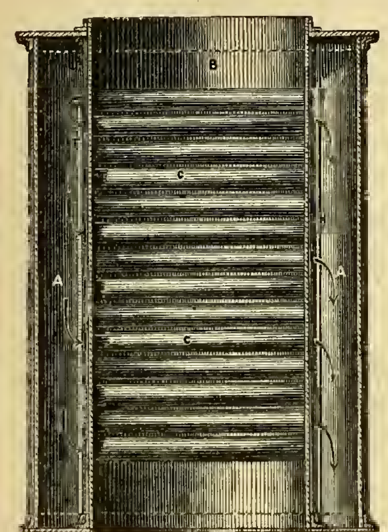
REGISTERED DESIGNS.

APPARATUS FOR SUPERHEATING STEAM.

Registered for Mr. John Hall, Jun., *New London Street, E.C., London.*

The accompanying figures represent sectional views of Mr. Hall's apparatus for superheating steam. Fig. 1 is a vertical section taken through the dotted line, shown in fig. 2, which is a transverse or horizontal section of the apparatus. The design consists of a jacket or cylindrical casing, A, arranged around the "uptake," B, on which the funnel is shipped. The jacket, A, is closed at the top and bottom, and forms a steam-tight chamber. Extending across the uptake, in diagonal directions, is a series of pipes, C, which open into the space enclosed by the jacket, A. The steam passes from the boiler through the pipe, D, and, after being superheated, is conveyed to the cylinder of the engine by the pipe, E. The superheating of the steam is effected partly by its coming in contact with the heated surface of the uptake, and by causing it to take a circuitous route, before reaching the egress pipe, E. The steam jacket, A, is divided into compartments by vertical partitions, part of which are open at the top or bottom, and part closed. The steam on entering the casing passes over the upper part of the partition, F, being prevented from going in the opposite direction by the closed partition, H. The passage of the steam round the casing is here prevented by the closed partition, H, so that it is forced to pass through the horizontal pipes, C, where the steam is exposed to the full effect of the highly heated current of gaseous matters ascending the uptake. The outflowing stream enters the opposite compartment of the casing, A, and here it is stopped from flowing in the direction of the ingress pipe, by the partition, H; so that it passes under the partition, O, and out by the pipe E. In this way, by means of this simple and inexpensive addition to the boiler, steam is superheated in a very effective way, and with an important saving of fuel.

Fig. 1.



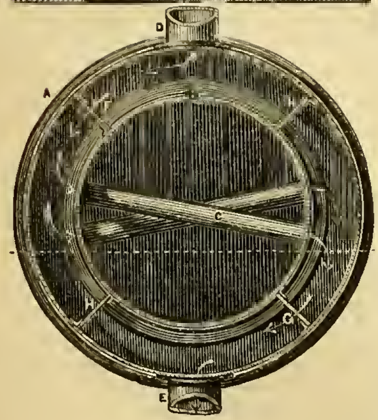


Fig. 2.

MECHANIC'S LIBRARY.

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Vision, Berkeley's Theory of, Vindicated, 4s. 6d. cloth. Edited by Cowell.
Yacht List, Universal, for 1860, square, 4s. boards. Hunt.

REVIEWS OF NEW BOOKS.

The Screw Propeller: Who Invented it? By Mr. Robert Wilson. 8vo. Pp. 54. Wood Engravings. Glasgow: Thomas Murray and Son. 1860.

The mystery which enshrouds the authorship of "Junius'" letters, and the discussions which have arisen therefrom, may fairly be said to be rivalled by the great controversy on the subject of "Who invented the Screw Propeller?" In the present case, Mr. Robert Wilson, so well known for his many inventions, particularly in connection with that splendid tool, the steam hammer, comes forward to assert his claims for consideration in the matter, and adduces, as we have long known he could do, some capital evidence in his favour. The little pamphlet which we are now discussing brings out many things which have hitherto been concealed from the public eye, or only dimly revealed. Mr. Wilson here gives, in chronological order, a history of the rise and progress of the screw propeller, first as it originated in his mind, and was subsequently put into practice.

"When walking one day in the country, my attention was arrested by a running stream acting upon an undershot water wheel, a piece of machinery I had never before seen. In this wheel, I at once recognised a great similarity of construction to that of the paddle wheels of the soldier's boat before referred to. This caused me to examine the water wheel carefully, and I found that the only difference worthy of notice was in the action being reversed—that is, the water acted upon the wheel instead of the wheel upon the water, and thus gave motion and power to drive the machinery in the mill, while in the case of the paddle wheels, they were driven by a separate power, which, acting upon the water, propelled the boat. This discovery, simple as it may seem, ultimately led, by further investigations—hereafter detailed—to an easy solution of my problem.

"Shortly afterwards, while taking a walk in a different part of East Lothian, I saw on the farm of Oxwellmains a wind-mill used for thrashing corn; and, on inquiry, I learnt that it reefed and unreefed its own sails, and turned its face always towards the wind—*all by self-action or mechanical self-control.*

"How this was effected, I determined to discover—and a few days after I again returned to Oxwellmains, taking with me a small telescope to enable me more closely to examine the mechanical arrangement of the wind-mill. The mill was not working, and I had therefore a better opportunity of studying it. I lay down on the ground so as to use my knee as a rest for the telescope, and in this position, while engaged in wonder and admiration, trying to follow and account for the various motions which I knew the mill to have, an idea suddenly occurred to me, which rendered it perfectly clear in what way I could modify the sculling oar, so as to make it serve as a means of propelling a vessel. This was by putting it in the form of a *wind wheel*, such as that I had before me, which I saw embodied the very principle I had been in search of—being capable of adaptation for performing all the functions necessary for perfect action under water. It was now plain to me that, as the paddle wheel represented the undershot water wheel with its action reversed, so would also the modification of the sculling oar be in like manner a representation of the wind wheel with its action reversed; and as this wind wheel was acted upon by the medium (the atmosphere) in which it was wholly immersed, with equal force on each blade or arm during the whole of each revolution, so would each blade of the new revolving sculls act upon the water with equal force, if entirely immersed, during the whole of each revolution, and be little liable to be materially affected by agitation of the surface, which had so much affected the success of the soldier's experiments with the side paddles.

"I therefore concluded that revolving sculls would be specially applicable to ocean propulsion, and I determined to make the demonstration of this opinion the object of my ambition. My energies, however, were cramped for a considerable time, owing to the want of the necessary means to carry out my ideas; but a small model in wood, with a set of four blades or revolving sculls, was made, and found to act as perfectly under water as I had seen the wind wheel do in the air. This, and similar subjects, gave my mind a more decided turn for mechanical pursuits; but as no opening could be found in any local engineering establishment, and as I had arrived at an age at which it was necessary to learn a trade, I was bound apprentice to a joiner and cabinet-maker. While thus engaged, I amused myself with various inventions. One of these was a horizontal *wind wheel*, which seemed to posses so much power as a prime mover, that I thought it would answer to drive my new propellers, so that a vessel might run in any direction, and even against the wind. With this idea, a model vessel, about two-and-a-half feet in length, was constructed and fitted with a set of propellers, and with a wind wheel to drive them; but I found that the model made little or no headway against the wind, and the scheme was therefore considered a failure. Driving by wind-power, however, was not the principal object I had in view, and not being at that time sufficiently conversant with the steam engine, or any other prime mover likely to suit the purpose of driving the propellers, they were laid aside until 1821, when the "Tourist" steamer (fitted out for the Leith and Aberdeen Steamboat Company by Mr. Gutzmer of Leith,) made her first series of sea voyages between Leith and London. In one of these trips, and when the vessel was off Dunbar, her steam-power was put to a severe test, owing to her having to encounter what is termed by the sailors, a *ground-swell*, that is, a heavy rolling sea unaccompanied by wind, and consequently very dangerous for vessels near the shore. Great fears were entertained for the vessel's safety, more especially as most people considered at that time that a steam voyage to London was little less than a tempting of Divine Providence. The vessel was seen to roll from side to side, and at every roll to go almost on her beam ends; and as her paddles were alternately high in the air and buried in the water, the steam-power was to a great extent rendered useless. This spectacle gave me fresh energy, as I considered that the screw propeller (or revolving sculls) would have been much better for such a vessel, and that, with such a propeller and sufficient power a steamboat might not only encounter a ground-swell without much inconvenience, but be safer in a storm than a paddle steamer or sailing vessel. I accordingly gave my screw the name of "Rough Sea or Storm Paddles," in contradistinction to side paddles, which I considered only suitable for smooth water, lake, or river navigation. In 1821, after making a number of experiments with the propeller, I had to leave the coast to pursue my trade, and the subject again rested for a time."

The period to which Mr. Wilson here refers, when the experiments were made with a four blade screw propeller, is between 1812 and 1821. Following up the idea four years afterwards he made another model, and in order to obtain additional surface he applied four other blades, but the disadvantages were found so great that the number was soon reduced to the original four. Then after numerous experiments with blades at various angles or pitches, and of different breadths, a further reduction was made in the number of the blades. Three blades were tried, and then two, bringing the propeller as nearly as possible to the form used at the present day. The proper position was also duly thought of and tested, as well as the combined use of the screw and paddles, just as we have it carried out in the *Great Eastern*, now on her first trip, which will set at rest the propriety of combining the two forms of propellers in future vessels.

"It may be proper here to mention that, in some of the first experiments, the propeller was placed in front of the rudder, and entirely under water, (the rudder being hung on a second or false stern-post), but the results were not so favourable as with the propeller behind the rudder; the stuffing-box, however, in both cases, through which the propeller shaft worked, gave so much trouble and annoyance, by the water leaking through it (the power being much reduced when all was made tight), that it was resolved to make some fresh experiments with the shaft above the water-line, so as to avoid the annoyance of the leakage, which moreover injured the clock-work.

"Seeing, that at the same time, that by using two propellers instead of one, and running in opposite directions, they would balance the oblique action of each other, as the opposite blades do with one propeller wholly immersed, and by having them double the diameter of the single one, they would be double the pitch with the same angle at the periphery or outer end of the blade, and so would give the same propelling power with half the number of revolutions, a model of about 3 feet long was made and fitted with screw propellers thus arranged, and so satisfactory were the results, that the subsequent experiments were made with the propellers on this plan, though it was clear that for Ships of War, if not for all Ocean Steamers, it would be necessary, as in the first experiments, to have the propellers entirely under water, proper means being devised to keep the water out without loss of power.

"In order thoroughly to prove my position, and leave nothing untried as far as my means would allow, and so as not to venture before the public unprepared, I fitted out the same model with a pair of side paddles of the best proportions the experience of that day pointed out; but in order to get a satisfactory trial, so as to make a fair comparison of the merits of the one system with the other, I considered it necessary either to cause the model to run the same distance with both plans each time the spring was wound up, or to so adjust the motion of the machinery and connect it with the shaft of the screw, as also with that of the side paddles, as that the model would be propelled at the *same speed* whether with the one or the other, when the water was perfectly smooth, and no wind to influence the motion of the model.

"I determined eventually to carry out the latter idea, viz., to obtain the same speed with both systems, and simple as this may appear, it turned out to be a work of great labour and requiring much perseverance; for each alteration required additional experiments, and as those experiments had to be made when there was no wind and the water perfectly smooth, it necessarily required a considerable time to get anything like the exact speed with both systems; especially as I had no opportunity of making experiments except on an exposed sheet of water, and the slightest breeze or ripple on the surface acted much against the side paddles, while it did not seem in the least degree to affect the action of the screw propellers.

"Had this not been the case these experiments would have been anything but encouraging, for when the water was perfectly smooth, the side paddles propelled the model fully one-half farther, or more than one and a half times as far as the screw propellers did, that is for each time the spring was wound up; but when circumstances were changed, and the surface of the water was in the least degree agitated, the speed of the model with the side paddles was not only reduced, but the distance passed over was also much below that travelled with the screw or stern paddles, while the latter in this slightly-agitated state of the water did not appear to be affected either as to speed or distance. When the water was so rough as to act on the model like a storm at sea on a vessel of greater magnitude, the side paddles, either with a side or head sea, were rendered entirely useless, and the model drifted with the wind and waves without making any headway. But with the screw propeller the result was widely different. Even under these circumstances the model was driven more than two-thirds the distance along which it was moved in perfectly smooth water, and with a side sea *or wind upon the beam*, the model with the screw propeller ran nearly the same distance as it did in perfectly smooth water, while with the side paddles, under these circumstances, it made no headway at all.

"This was the triumph I expected to obtain, and farther, as the surface of the ocean is seldom what may be termed perfectly smooth, I was convinced that, even in fine weather, the screw propeller would be nearly a match for the side paddles on the open sea."

This brings the time down to 1827; and in that year, through the kindness of the President of the Dunbar Mechanic's Institute, the author was introduced to the Earl of Lauderdale, who, in company with other influential gentlemen, witnessed experiments with the model, when the superiority of the screw, or revolving sculls, as they were then called, was most apparent. His lordship undertook to bring the invention under the notice of the Lords of the Admiralty, and the heart of the young inventor beat high with expectation. But here we have the old, old tale: "my Lords" refused to notice the invention, or even witness the experiments with the model. This was a death-blow to the sanguine hopes which had been built on the sandy foundation of official justice and liberality. In 1828, the Highland Society, after a committee had witnessed the experiments, voted £10 to enable Mr. Wilson to apply it to a 25 feet boat. She was fitted with two screws arranged longitudinally, the motion of the driving handles being communicated to the screws by means of bevel gearing. On the day of trial the weather was very stormy. The boat, however, fully answered the expectations which had been formed, and gave the inventor full confidence in the principle as applicable to steam ships exposed to heavy storms at sea. The correctness of Mr. Wilson's views on this point is now familiar to every one, as the exposure of the British fleet during the recent gales amply prove. In May, 1832, the Royal Scottish Society of Arts appointed a committee to make experiments with a boat 18 feet 7 inches long. These experiments gave great satisfaction; and the applicability of the propeller to ships of war was particularly dwelt upon, in consequence of its being under water and out of the reach of shot. Another effort was made with "my Lords," and after the usual tedious delay, a report from Mr. Oliver Lang, of whom one would have expected better things, and from Mr. R. Abethell, was issued, stating "that the plan (independent of practical difficulties) is objectionable, as it involves greater loss of power than the common mode of applying the wheels to the side." And here ends Mr Wilson's sad experience of Admiralty management. In language remarkable for its temperate tone, and which reflects the highest credit on the author's good sense, he thus notices the introduction of Mr. Smith's screw:—

"It may not be uninteresting briefly to glance at the rise and success of Mr. Smith's invention of the screw propeller, or rather of his '*improved propeller*,' as he termed it, as he does not seem to have claimed the merit of originating it. In 1835, Mr. Smith, then a farmer at Hendon, had his attention first directed to the subject of screw propulsion; in the spring of 1836, he obtained the co-operation of a Mr. Wright, a banker, and a patent was granted to Mr. Smith, on the 31st May, 1836, for his 'improved' screw propeller, which consisted of two entire turns of a single-threaded screw. A model boat which he had constructed, and which was fitted with a wooden screw driven by a spring, was then exhibited in operation upon a pond on his farm at Hendon, and at the Adelaide Gallery in London. The results obtained with the model were so satisfactory that, in the autumn of the same year, Mr. Smith and his friends constructed a boat of six tons burthen, and about six horse-power. On 1st November, 1836, she was exhibited to the public, in operation, on the Paddington Canal, and she plied there, and on the Thames, until September, 1837. During one of the trips on the Paddington Canal, in February, 1837, an *accident* occurred which first pointed out the advantage of diminishing the length of the screw. The propeller having come in contact with some object in the water, about one-half of its length was broken away, and no sooner had this occurred, than the boat quickened her speed and was found to realise a better performance than before. In consequence of this accidental discovery, a new screw was fitted, having a single turn, and the results were very satisfactory. To show that his screw was suitable for sea voyages, Mr. Smith, in September, 1837, went in his experimental boat from Blackwall to Ramsgate, and thence to Dover and other places. In March, 1838, the screw was tried before the Admiralty. After several trials, in May, 1839, before Captain Crispin, Admiral Fleming, and others, with Mr. Smith's larger vessel, the *Archimedes*, (which cost him and his friends £10,500,) against a Government vessel, and after numerous other trials both at home and abroad, and when the advantages of the screw over the paddle wheel were rendered obvious to every one, the Admiralty determined to try the screw, and the *Rattler* was, in 1841, begun for the Navy. In 1845, when the steam Navy was about to be considerably increased, the Board of the Steam Department, Somerset House, 'determined that the screw should be adopted,' and thus Mr. Smith obtained a world-wide renown as having firmly established the principle of the screw propeller in Great Britain as Captain Ericsson did in America.

"These sketches of my efforts to introduce the screw propeller and render it useful to my country, and the statements concerning Mr. Smith, suggest, without the smallest disparagement to that gentleman, a somewhat startling contrast.

"I, a *mere boy* and afterwards a working lad, first take up the idea of the screw propeller in 1808; Mr. Smith, a grazing farmer (born 1808), does so in 1834. The invention, costs me, ere its last rejection by Government, some twenty-five years more or less of labour, privation, and anxiety; Mr. Smith in a very short time finds a friend in Mr. Wright, and, in 1845, his improved propeller is finally adopted in the Navy; and becomes common in the merchant service. I, backed by the best influence in Scotland, for the second time, offer the invention, gratuitously, to the Admiralty in 1833, and it is rejected as inferior to side paddles: Mr. Smith, secured by a patent, and backed by rich and enterprising commercial men, and by public opinion, brings the matter as a commercial speculation before the Admiralty in 1838, and three years later the Government are building screw ships. I make (passing over all preliminary experiments on lakes) a trial of the screw in an eighteen feet boat, in 1828, in the open sea, in presence of Vice-Admiral Sir David Milne and many other official gentlemen, and in a sea so rough and dangerous that none of the pilots at Leith would accompany the experimenters: in September, 1837, Mr. Smith (keeping lake and canal experiments out of view) tests his six ton boat at sea: and finally, in 1845, twelve years after finally rejecting the screw propeller at my hands, the Government accept and 'adopt' it at Mr. Smith's.

"Some persons may say, why did I not secure a patent? To this I answer, that my means were inadequate, and I had no friends who could assist me to procure one; and moreover, although I had had opportunities of doing this, such an idea would probably not have occurred to me, as I had no selfish object in view. Besides this, I had not kept my invention secret. I knew it was valuable, and what I most desired was, to make it useful to my fellow-men. Nor is it by any means certain, though I had secured a patent, that this would have led to the adoption of the screw by Government. I might have shared the fate of Captain Ericsson in England, without obtaining the ultimate success which fell to his lot in a foreign land. This accomplished mechanician took out a patent for the screw propeller in July, 1836—little more than a month after Smith. In 1837, he exhibited his vessel to the Lords of the Admiralty, and towed the barge in which they were seated at the rate of ten miles an hour, and yet, notwithstanding this success, Captain Ericsson, from some 'inscrutable reason,' received no encouragement from the Admiralty. He went to America in disgust. His propeller was introduced into the United States Navy, and hundreds of vessels in America are now propelled by the screw—his propeller being still taken as the type which has been almost universally adopted in America. The French nation also encouraged him; the Admiralty of England at last, seven years after rejecting his invention, (and after America and France had pronounced it a valuable one,) gave an order for the fitting up of the "Amphion" frigate with his propeller. Captain Ericsson at length discovered that the "inscrutable reason" lay in an idea taken up by the Surveyor of the Navy, that *as the propelling power was applied at the stern, the vessel could not be steered in an efficient manner.* I repeat, therefore, that even though I had obtained a patent, some inscrutable reason might have rendered the fruit of it only the ruin of some over-confident friend. May not my own experience, and occasional paragraphs in newspapers, suggest the fear that many a promising inventor may be unable to realize his plans from want of the means to bring them forward, or owing to the incredulity of those to whom this invention may have been submitted, and that thus the public may be deprived of benefits which otherwise might have been enjoyed? The great reduction in the price of patents has to some extent removed a stumbling-block which formerly lay in the path of inventors; but if unable, or unwilling to turn his discovery into a commercial speculation, by patenting it, the career of an inventor is far from an enticing one. He has to pass, at first, through the trying ordeal of being looked upon as a visionary and a dreamer; he lives for a time surrounded, as it were, by an atmosphere of—as Thomas Carlyle would say—"deaf, dead, infinite injustice," conscious in his own mind that he is right, but supposed by everybody to be wrong; he has to bear up against the indifference of the learned and the ridicule of the ignorant; or if, perchance, he happens to meet as I did with the encouragement of those who can rise superior to stereotyped opinions, all his efforts may yet, after the labour and anxieties of many years, end in disappointment, and he may live to see the rejectors of his invention, when it is again offered by another, roused from their indifference by the voice of public opinion, and become suddenly enthusiastic in doing honour to a discovery which years before they had cast carelessly away.

It is somewhat remarkable that after "my Lords" did condescend to notice Mr. Smith's propeller, backed, as it was, by the weighty influence of a banker, that neither they nor their intelligent Barnacle Tites should remember that one Robert Wilson had, in 1827, and again in 1832, brought before them a similar invention, as their letter books would prove. But there was this difference in the propellers, that Robert Wilson's was far superior to Smith's, for it closely resembled the most approved form of screw of the present day; for the inventor had gone through a series of experiments exactly similar to those upon which "my Lords" subsequently expended so many thousands of the public money. The rejection of Mr. Wilson's invention by the Admiralty and the subsequent adopting it at other hands, is one of a hundred similar cases of injustice which might be adduced. And although it may be but poor consolation to him that others equally deserving have been rejected, it must nevertheless afford him some consolation to think that he is one of that noble company who are indeed the true benefactors of the human race.

A Practical Treatise on the Turbine, or Horizontal Wheel. By William Cullen. 4to. Pp. 23. Plates. London: E. and F. Spon. 1860.

The author of "The Industrial Resources of Ireland," Sir Robert Kane, President of Queen's College, Cork, in the pages of the work we have quoted, directs the attention of his countrymen to the important value of the turbine, as a prime mover. Sir Robert expresses a hope that some practical man in Ireland might take up the subject; at the same time he points to Rühlman's work on Turbines, a translation of which has been published by himself. The treatise we have now under notice, is the result of a perusal of Sir Robert Kane's books, and the suggestion thus thrown out. Although the work Mr. Cullen has produced is sufficiently concise, yet it is so thoroughly practical, and laid down in such a clear and able manner, that we wish our author had found more to say on the subject. Referring to Rühlman's work, Mr. Cullen says:—

"I applied myself to the study of this book, and found that, as regarded practice, it presented in its examples so many intricate and complicated formulas, as to deter many operatives, unless those of superior education, from even attempting to study it; or, in other words, for plain, simple directions, it is very much deficient; mine, on the contrary, is intended to convey to such as are unable to comprehend those formulas, such plain and practical rules as will enable them to calculate and construct the various portions of the turbine water wheels, which will realise the many advantages justly ascribed to these most important machines."

And well, indeed, does the writer carry out the task he set himself. Let it be borne in mind that Mr. Cullen is a practical millwright and engineer, and in a narrative which is "as interesting as a fairy tale," he tells us how he went to work.

"In order to arrive at the fountain-head, as it were, I visited France, and lost no time is securing an interview with the eminent inventor of the turbine, M. Fourneyron, in company with a gentleman then a resident in the Irish College at Paris, who kindly acted as interpreter; but from the extravagant demands made by M. Fourneyron for the information required, I found it impossible to effect any satisfactory arrangements with him. Being determined that my journey should not, if possible prove abortive, I ascertained the address of his model-maker, Mons. Cleir, and visited his establishment, where I had an opportunity of inspecting a model turbine, on Mons. Fontain's principle of construction, and was informed that this model was made to represent that of a large wheel now driving a saw mill at St. Maur. I subsequently visited the foundry of Messieurs Pihet and Co., where Fourneyron had his wheels manufactured; but information was there scrupulously withheld, and it was stated to us that the important portion of the constructive drawings could not be seen without the special leave of the inventor. While at the foundry, I had, however, an opportunity of examining the first wheel that was made for St. Blazien by Fourneyron, which was lying in the foundry yard. I then formed an idea of his plan of construction. I was also informed, that this wheel, then lying in such a careless manner, had for a long time been in operation under a waterfall of about 118 feet, and had given the owner such satisfaction that he afterwards enlarged his mill, and had this wheel replaced by a second turbine, made to suit a waterfall of about three times higher than the former. I afterwards visited the flour mill of St. Maur, and was kindly permitted to examine all its machinery, but the turbines at that time of my visit were working so deep in the back water, I could only observe the upright shafts. A little higher up on the same river I examined the saw mill before alluded to, and driven by Foutain's turbine, which was also working under back water, and at the same time driving a great number of upright and circular saws with undeviating regularity. The machinery in both these mills are driven by the River Marne. The commanding structure and appearance of the flour mill, and its powerful and ingeniously constructed machinery, certainly excited my surprise and admiration. This mill has forty pairs of stones, with all their requisite machinery for cleaning and dressing the flour which is driven by four turbines of co-equal power, each of which, having on its shaft one large spur wheel gearing into ten pinions, which set in motion the ten pairs of stones surrounding the shaft, and the entire machinery of the mill, when in motion, resolves itself into harmonious uniformity of action. This plan, apparently so simple in construction, and so grand in results, is worthy of the high fame of Mons. B. Fourneyron, who arranged and furnished the constructive drawings of the entire building and machinery."

Pretty clear proof that our traveller is a man of the right stamp, observant and intelligent. He goes next to the flour mills of M. D'Arhley, where he was refused admission. On his return to Paris, he was received with marked courtesy by Messrs. Callou & Sons, Engineers, who kindly explained their plan of constructing turbines. On his return to Ireland, he constructed a model, and subsequently he laid his plans before Mr. M'Adam of Belfast, one of the proprietors of a foundry there,—

"Who, on considering the matter, requested me to furnish him with constructive drawings for the manufacture of a turbine, to which I assented, on certain conditions unnecessary to specify here. I then furnished him with the requisite drawings, from which a wheel was constructed for a fall of 21 feet, erected at the linen bleach mill of Messrs. Barklie & Co., at Mullemore, near Coleraine, in the County of Antrim. This wheel had on several occasions worked nearly nine feet under the tail water with the greatest uniformity, and at the same time lifting a series of weighty stampers for washing linen cloth, and driving other alternate machinery. Since that time the Messrs. M'Adam have made several wheels on Fourneyron's system. The work performed by one of them is fully reported in the *Practical Mechanics' Journal* of April, 1853, in which it is stated that this turbine has produced a moving force equal to 85 per cent. of the absolute power of the water that supplied it."

His "story being done," we have a chapter devoted to remarks on turbines, with historical notices of the original turbine of Fourneyron, and the subsequent modifications of Poncelet, Prof. James Thompson, Fontain, and Jonval—one of the latter was engraved and noticed in our pages. Mr. Cullen then describes the several turbines shown in the plates accompanying his work, and concludes with the practical rules for obtaining the several proportions of turbines, and some tabular matter. The rules which are given are very clearly and minutely laid down, and are such as will enable any engineer of ordinary capacity, to calculate and construct a turbine, capable of doing any given amount of work. Upon the advantages of the turbine over the ponderous vertical wheel, it is needless to dilate, experience has shown them to be in every way superior, and better adapted for transmitting motion. The turbine is capable of being worked with advantage in conjunction with a steam engine, and may be used for driving all the machinery when repairs are required. Our millowners will do well to look about them, and see whether they cannot avail themselves much more generally than is now the case, of this most useful auxiliary. We cordially congratulate Mr. Cullen upon the manner in which he has discharged his duty in clearing away the difficulties of an intricate subject. We feel assured that his work will be held in esteem by every practical engineer throughout the country who is in any way interested in the subject.

CORRESPONDENCE.

GORHAM'S KALEIDOSCOPIC COLOUR TOP.

[Mr. John Gorham, the inventor and patentee of the Kaleidoscopic Colour Top, has written a long letter to us on the subject of the notice which appeared in the *Practical Mechanic's Journal*, for April last, of Mr. Goodchild's Trocheidoscope. Mr. Gorham refers to a paper published by him in the *Microscopical Quarterly Journal*, for January, 1859, forwarding a copy to us, and states that Mr. Goodchild has largely plagiarised from that paper, having founded his instrument upon the experiments there detailed. Mr. Gorham's letter is too long to be printed in *extenso*, but we willingly give insertion to the following passages which comprehend the substance of it.]

Mr. Goodchild's only claim to originality consists in his having used a mode of rotation different to mine; that is to say, cogged wheel machinery, instead of what for simplicity's sake I have called a colour top. The experiments which I have patented are so delicate in their nature, however, and require rotation about a fiducial axis so unerring, that the action of my colour top is as perfect as that which can be evolved by the nicest machinery; were I to give a preference to Mr. Goodchild's rotating apparatus, for I am not anxious to deprive him of any merit really due to him, I should do so by saying that it depended on the ease and facility with which the rotation may be effected. To invent a rotating apparatus, however, is one thing—to adapt a series of discs to its surface for the elucidation of a difficult subject in physics is another. I find Mr. Goodchild looking about accordingly, and at length to his cogged apparatus, he seems to have applied all and every thing on which he could lay his hands, regardless of the fact that he is scarcely more than a compiler.

In your review considerable stress is laid on the complementary colours as evolved from the originals, and you adduce these experiments as an instance of the "value of Mr. Goodchild's instrument as an educational medium, and its truthful exposition of a natural law." Now, my paper will show you that these experiments originated entirely with myself, and the paragraph which treats of them (§ 3) contains not only an account of the experiments themselves, but the rationale of the process, the necessity, viz., for the production of *gray*, in order to render the complementaries visible; all this is omitted by our inventor, who, throughout the whole of his pamphlet, is more anxious to please the eye than inform the judgment, although he ingeniously attempts to show that he "lays down first principles, working out a few of the effects by way of example."

Whenever Mr. Goodchild has altered any paragraph in my pamphlet, he has almost invariably converted it into nonsense. Take, for example, the following definition of a complementary colour as it occurs in my paper:—"The three primary colours are yellow, red, and blue, what is wanting in a given colour to complete this triad is called its complementary," and compare it with the definition of a complementary contained in his pamphlet:—"Complementary colours are those which make a white light when mixed by rotation" (page 5). This is manifestly false, and requires no comment to prove it so.

I shall next beg to direct your attention to the "blending of colours by soft or insensible gradation," my remarks on this head are contained in § 5, page 9 of my paper.

The figure used for this purpose partakes of the outline of a *heart*. Now, I would commence by observing that there is and can be but one spiral curve proper to form the boundary of this cordate appendage, and in order to construct this curve the rule contained in my paper (§ 5, fig. 11) must be strictly followed. Mr. Goodchild does not appear to comprehend this; he adopts a pattern, therefore, at random (fig. 3, page 7, of his pamphlet), introduces it of course as his own, and loses altogether the delicate and soft blending with transition of hue, which the curve —founded upon an enlargement in simple arithmetical progression from the circumference to the centre, in parallel segments of the circle—is alone able to effect.

In connection with this appendage, he further observes (page 69) that "it will show a beautiful self-coloured centre (of whatever colour the heart may be), and shaded border." Now, all this is very exceptional language, because it is erroneous; whenever the cordate appendage is used (and I could show Mr. Goodchild a mode of using it with which he would be startled, as the effects partake so much of the magic to please the eye,) the centre is not *self-coloured*, but owes its colour entirely to that of the heart itself; neither is the border *shaded* unless the heart itself be black, but it is softened off into the particular *hue* of which the colour on the disc and that on the heart are the elements.

This is the second disc with its contingent experiments which Mr. Goodchild has surreptitiously transferred from my paper to his own.

Not content with thus using my experiments, Mr. Goodchild next attempts to injure my reputation by remarks tending to depreciate my kaleidoscopic effects, and which he knows he is prohibited using. Thus, in pages 8 and 9 of his pamphlet, he says, in allusion to these effects—"The original pattern, however, being entirely merged into one more intricate and complex, and being shown quite horizontal, the colours are partially shaded, which is not the case with patterns hung at an angle on my principle. Again, by the non-revolving patterns, the design is coloured and enriched, and does not lose itself in the movements before the eye, which gives the trocheidoscope a great advantage."

Now, the very reverse of all this is the truth, as the merest novice in physics would perceive. There is no doubt that Mr. Goodchild's mode of procuring the coloured patterns, on which he lays so much stress, would never have occurred to him but for his having seen my invention. For be it observed, in both of the discs, mine and his, (mine published and patented in January, 1859, his copied from them in 1860,) there is *a hole for the spindle*, *a perforated pattern*, and *an appendage of string at the circumference.* Mine is allowed to rotate on the spindle, the diameter of which, and the hole in the disc, are in a certain specified ratio. During rotation its motion is retarded and tremulous, owing to the production of a series of cycloid curves, effected by the string in its impulses on the atmosphere. There are also entire cessations of motion recurring at regular intervals, and about thirty times for one revolution of the perforated disc; these cessations mark the cusp of every cycloid, and it is upon their existence that the clearness, distinctness, and beautiful colouring of every mark, dot, and line, in any pattern depends, and which never lose themselves in the complexity of multiplication as Mr Goodchild implies.

Mr. Goodchild's disc, on the other hand, is hung, not on the true axis of the spindle, but on a projection a little on one side of it—no rotation is allowed (for obvious reasons touching the patent law), the end of the string is secured; therefore, to prevent it, the forces employed necessarily produce *circular* and *continuous* motion to every particle in the disc, whether it be a hole, a line, or a number of these compounded into a pattern, for any point in a radius revolving about a centre is resolved into a circle. Now, *continuous* movement never allows a distinct impression to be made on the retina of the eye, as a certain length of time is always required to depict an image on this living camera—an object may fly past so quick as not to be seen. This is exactly the predicament in which these perforated discs are placed when used on Goodchild's instrument; the colours are constantly on the move without cessation, so are the patterns, hence a confused mass of colour is all that can be distinguished theoretically or practically by this instrument.

I would next notice, by way of furnishing an instance of Mr. Goodchild's ignorance of the principles on which he is laying down rules for the guidance of the public, a passage occurring in page 11 of his pamphlet. He is introducing an old and hackneyed experiment which has had its run in the optician's shops so long ago as I can remember. He says, "Put down a disc with the seven prismatic colours, in the proportions shown in the spectrum, white will be produced." Now, white has never yet been formed in this way, but only a *neutral.* If white light were thus produced it would not prove that it resulted from mixture of the seven prismatic colours, because prismatic analysis shows that none of the pigments reflect either of these colours in their pure state, but always other coloured rays besides those which are apparent to the naked eye.

In conclusion, I will beg to detain you for a moment longer, with the following facts:—

The disc (fig. 15, Goodchild's pamphlet, and fig. 5, *Practical Mechanic's Journal,*) has been issued by me for upwards of a year through the firm of Elliott, Brothers, 30 Strand.

The disc (fig. 12, Goodchild's pamphlet) is a type of which a large number of figures were shown to Mr. Goodchild by myself, when he paid me a visit prior to bringing out his instrument.

The disc (fig 3, Goodchild's pamphlet) is a distorted copy of my original heart-shaped pattern for softening off.

The disc (fig. 11, Goodchild's pamphlet) is my double semizone issued in every kaleidoscopic top since its publication.

The discs (figs. 4, 5, 6, 8, 9, 10, Goodchild's pamphlet) are mere puerile imitations of my perforated discs, not being allowed to move round the spindle, but only shuffled to aud fro upon it, a movement which may be performed by a dexterous hand almost as satisfactorily as by the trocheidoscope, and certainly with results equally useful.

The *chromascope* (fig. 16, Goodchild's pamphlet) is worse than useless, as all the experiments are *binocular*. To peep at them with one eye spoils the results.

John Gorham.

Tunbridge, Kent, June, 1860.

ROTATION OF BODIES ON THEIR AXES.

After three months silence, Mr. Hill not being able to make his tape indicator produce more than one indication out of five, sends forth a new edition of his former letter of April last, with the addition of a few more *Fantoccini* lunar exercises. I may remind Mr. Hill that a certain *Paganini* made numerous variations upon *one* string. Mr. Hill employs *two*. Suppose another mechanic adds a *few more*, the moon might then he made to dance a hornpipe. Does Mr. Hill imagine he has found out a new principle in string, that it will twist up as well as untwist if a force sufficient is applied for that purpose. I have not admitted the *five revolutions* as asserted by Mr. Hill. I allowed for argument's sake Mr. Hill's twist to count for one, without entering on the questionable means by which it was obtained, as the text of my letter of February will fully prove. Does Mr. Hill imagine that distance will make any difference to the motions said to be possessed by revolving bodies? If Mr. Hill finds fault with me for not venturing "higher than balloons can go," what must your readers think of Mr. Hill's humility in not venturing higher than the ceiling?

Every practical mechanic will understand the reason why an indicator of the motions of a machine should be wholly attached to that machine.

My letter of December last which contains a mechanical denial of the astronomical theory of the moon's rotations, remains untouched by all that has yet been said against it. Mr. Hill *alone* by mutilating the machine there represented tries to pervert one of the most palpable of the laws of proportion. To bring my opponent to the point in question, I now challenge Mr. Hill, or any other person, astronomer or mechanic, to attach an indicator to the machine represented in fig. 2, in my letter of last December, which shall fairly indicate "five rotations" of the ball, B, "on its own axis," in one revolution round the axis, A, fig. 2, as asserted by Mr. Hill in his letter of January, 1860. It will be seen that the machine is so made that the only part on which these indications can be marked is the surface of the ball, B; therefore, to facilitate the operations of any one who may undertake this task, the ball, B, and its wheel may be made equal in diameter, the teeth of the wheel will then be level with its surface, thereby leaving the surface of the ball more free to be operated upon.

Cheltenham, June, 1860. Bertram Mitford.

FORGERY OF TRADE MARKS.

The special attention of Government is just now directed to the forgery of trade marks. It therefore appears to us most desirable that manufacturers should lay their experience on this subject before the Board of Trade.

Probably few persons, except those directly concerned, are aware of the great extent of this disgraceful traffic, especially upon the Continent.

We have been winders and manufacturers of sewing cotton for about 70 years, hence our reels and other goods have long been known and frequently been forged; but at no time during our whole experience have our goods been so extensively imitated as at present.

We have the name of a foreign manufacturer who is now largely competing with us in the sale of patent glace thread; his inferior manufacture bears our crest of a boar's head, with our name and address in full, and each dozen of thread is enclosed with a wrapper so exactly copied from our own, not only in name and marks, but in the precise shade of colour, that we can only distinguish the forgery from our own labels by the closest comparison.

Our reels of crochet cotton are forged in a similar style; we receive complaints of quality from abroad, and on investigation counterfeit reels are sent to us, containing very inferior cotton, and having extra thick wood barrels, so as to hold short lengths of thread.

Trade is crippled by such practice; but the most galling injury by far is the loss of character we must sustain by the sale of these fraudulent goods, since they are both bad in quality and dishonest in measure.

Belgian cutlers have sent to South America knives made, not of steel, but of soft iron, bearing the name and trade marks of Messrs. Rodgers. This was designed to injure the credit of that firm, so as to prepare the market for the reception of knives in quality far inferior to those really made by Messrs Rodgers.

A large quantity of these fictitious knives was actually seized a few months since in London, where they had been sent from Germany for re-shipment to South America.

Cases no less flagrant could be quoted to an endless extent. Against these things a remedy is at present most difficult to find or to apply; but we learn that the forgery of trade marks is likely to be made a criminal offence in this country, and there is further strong reason to hope that foreign Governments will be induced to co-operate with our own in extending abroad this great boon to all honest traders.

It is with an expectation of earnest assistance from leading firms, and with the hope that you will again give to this important subject the weight of your able and lucid exposition, that we trespass upon your courtesy for the insertion of this letter.

Walter Evans & Co.

Boar's Head Cotton Manufactory,
Derby, May, 1860.

Mr. John Chubb, of St. Paul's Churchyard, the well-known lock and safe manufacturer, has since made the following suggestions on the law of trade marks:—The proposed alteration of the law is good as far as it goes; but I submit there are two additional points worthy of consideration and adoption. First, there should be a national registry of trade-marks. It should be the duty of the registrar to see that the device or name claimed by an applicant should not be in imitation of any existing registration. An official certificate of registration should be received in any Court as sufficient evidence of the right of the manufacturer to whom it is granted. The only difficulty in the matter would be that, in a few cases at the onset, there may be several claimants to a particular mark, but such cases might be settled by a good lawyer and two or three intelligent men of business. Secondly, power should be given to any magistrate to grant, upon reasonable cause being shown, a search-warrant for articles having forged trade-marks on them, the applicant, of course, taking all the risk of the proceeding. A case in my own business will illustrate the necessity of this proposal, and it is only, I suspect, one out of many frequently occurring in other trades as well. A manufacturer received and executed an order from a dealer for a quantity of common locks. I had private information at the time that on receipt of the goods they were all stamped by the dealer with my trade-mark, and were packed and shipped off within a few hours. I had neither time nor evidence sufficient to apply for an injunction, but a search-warrant would have met the case and detected the fraud.

[We have often emphatically pointed out how trade marks are essentially part and parcel of the stock-in-trade of manufacturers. It is gratifying to find that the subject has gradually aroused the attention of interested parties, and that there is now a fair prospect of something being done for the annihilation of a gigantic evil.—Ed. *P. M. Journal.*]

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL SOCIETY.

May 24, 1860.

"Report of an expedition to Naples to investigate the phenomena of the earthquake," by Mr. R. Mallett. The report was accompanied by an extensive series of photographs, maps, and geological specimens.

INSTITUTION OF CIVIL ENGINEERS.

May 15, 1860.

Discussion upon Mr. J. J. Berkeley's paper on Indian railways.

May 22.

"On breakwaters, part 2," by Mr. M. Scott, M.I.C.E. This paper was a continuation of one read in December, 1858.

"On the method of computing the strains and deflections of continuous beams under various conditions of load, &c.," by Mr. J. M. Heppel, M.I.C.E. This paper was stated to be of so purely mathematical a character as to be unsuited for reading. It would therefore be published in the minutes of the proceedings.

SOCIETY OF ARTS.

May 23, 1860.

"On the history, geographical, geological, distribution, and commercial bearings of the marbles of Tuscany and Modena, and of the Boracic acid lagoons," by Mr. W. P. Jervis.

May 30.

"On building woods, the cause of their decay, and the means of preventing their decay," by G. R. Burnell, Esq., F.G.S., F.S.A

ROYAL INSTITUTION.

March 23 1860.

"On diamonds," by N. S. Maskelyne, Esq.

April 27.

"On recent application of science in reference to the efficiency and welfare of military forces," by Mr. F. A. Ahel, Director of the Chemical Establishment of the War Department. After describing the construction of the Nasmyth, Mallett, Blakeley, and Armstrong guns, he referred to the application of cast steel to the manufacture of ordnance. While these important results have been obtained with guns of wrought iron, bnilt up of rings, others, scarcely less valnable, have attended the application of materials, varying in their nature between steel and malleable iron, to the production of light guns, cast in one piece. M. Krupp, of Essen, was the first to produce masses of cast steel of sufficient size for conversion into cannon. A 12-pounder gun, cast of this material, was experimented upon in this country several years ago, and exhibited the most extraordinary powers of endurance, having withstood the heaviest proofs without bursting. Similarly good results were obtained with cast steel in France and Germany, and it is now applied to the construction of the rifled field guns in Prussia. A cast material, somewhat similar in character to this steel of M. Krupp, and to which the name of homogenous iron has been given, has recently received most successful application in the hands of Mr. Whitworth, not only to the production of the barrels for his rifle-small-arms, but also to the manufacture of his beautiful rifle-cannon. The smaller cannon are cast in one piece, and then forged to the required form. The heavy guns (80 and 100-pounders) consist, however, of cylinders of homogenous iron—upon which hoops of fibrous iron are forced by hydraulic pressure, the breech-portion receiving hoops of puddled steel. The small Whitworth guns undoubtedly possess the great advantage of simplicity of construction over the compound guns just described; but the present great expense of the material gives the latter the advantage in point of cost. There can be little doubt, however, that the facilities for obtaining products of this description will increase with the demand; and there appears no reason why the process of Mr. Bessemer, which has recently been applied with great success to the conversion of iron of good chemical quality into excellent cast steel, upon a very considerable scale, should not be resorted to for the production, at a moderate cost, of masses of cast steel, or a material of a similar character, of sufficient size for conversion into cannon of all sizes but those of the heaviest calibre, which it will, perhaps, always be found most advantageous to construct of several pieces, upon the principles just now referred to.

The protection of camp-erections from fire has also received attention with successful results. A cheap and ready mode of applying a coating of insoluble silicate of lime and soda to the surface of camp-huts, whereby very important protection against fire is attained, received application a few years ago; and quite recently a method has been devised by Mr. Abel of impregnating tent-cloth with silicates, to such an extent as effectually to prevent fire from spreading, when applied to any portion of it, and in such a form as to enable them to resist the solvent effects of drenching rains.

The application of solnble silicates to the preparation of very porous artificial stone has enabled Mr. Ransome to produce portable filters, by the aid of which the soldier may frequently be enabled to partake of water, which otherwise would be unfit for use. A still more efficient portable filter is now, however, prepared of carbon in a porous condition, which not only has the property of retaining the mechanical impurities of water in its passage through it, but also will purify it to a very considerable extent from injurious organic matters and gases which it may contain.

May 24

"On the decay and preservation of building materials," by Professor Ansted. Commencing with a general remark, that all stones are rotten and weathered at the top of a quarry or near an earthy surface, and that the action of the weather on them is, in some measure, thus indicated, he first alluded to granite. He stated its properties of hardness and great durability in ordinary cases; but remarked that when soda replaced potash in the felspar, the crystals of felspar were subject to the action of the weather, and that, from some cause little known, the silica base also occasionally failed. Still, the great practical objection to the use of granite is its cost. Passing next to the sandstones, he defined them, mentioning the chief varieties. He stated that the nature of decay in sandstones was generally the failure of the cementing medium, which is sometimes silicious, but more frequently calcareous or clayey, or even oxide of iron. He pointed out as the causes of decay the want of sufficient cohesion in the cementing medium—the nature of the cementing medium itself, and the effect of expansion and contraction of water absorbed by the stone. The limestones were next considered, and the principal varieties passed briefly under review. The Professor next proceeded to consider the remedies for decay. He alluded to paint as at once unsightly and not permanently beneficial, and included the large class of preservatives that have been suggested, in which any animal or vegetable oil or fatty matter was contained, as equally valueless, either peeling off or rotting in the stone, and leaving it soon exposed to ordinary decay. The mineral bitumens, he stated, had not been much tried, owing to their dark, unsightly colour. What is required is some mineral preparation. He then alluded to the water-glass, a soluble silicate of potash, originally described by Dr. Fuchs, and applied to indurate stone by M. Khulmann. He explained the principle of this process as depending on slow decomposition by exposure to the air, and stated that, as meanwhile the influences of the weather continued to act, the method could not be adopted with advantage in the open air in a damp climate, where preservation is chiefly required. The only plan that, as far as he was aware, met the requirements of the case, he stated to be that adopted by Mr. Ransome, according to which the absorbent surface, whether of stone or terra-cotta, was saturated with the diluted solution of soluble silicate of soda, and then treated with a solution of chloride of calcium. By the mutual action of these solutions, a double decomposition is induced, the silicic acid parting with its soda to the chlorine, producing chloride of sodium, or common salt, and combining with the lime to form silicate of lime. The salt being washed away, only the silicate of lime remains. The silicate of lime thus thrown down he next explained to be a salt, which was not only itself non-absorbent and singularly powerful in resisting the action of ordinary atmospheric influences, but as having the property of adhering rapidly to the surface of the minute particles of which stone was formed. He illustrated this by the case of mortar and concrete, which owe their adhesive properties to this habit of silicate of lime, which is the mineral formed by the mutual action of the cement on the substances in contact with it. The stone having its particles thus coated with silicate of lime, and all the absorbent surface being thus protected, the result is an immediate and great hardening of the stone, so far within its substance as the solutions have been absorbed, and a complete immunity to that extent from the action of atmospheric influences. The stone does not necessarily become non-absorbent, though it can be made so; but it absorbs much less rapidly than before, and appears to resist decay much in the way that some of the best natural sandstones, such as Craighill, are known to do.

GEOGRAPHICAL SOCIETY.

June 11, 1860.

"On a boat excursion from Bangkok to Pechahurri, and a general report on the trade of Siam," by Sir R. H. Schomburgh.

"On Western Africa," by Mr. D. Delany and Mr. Campbell.

GEOLOGICAL SOCIETY.

May, 16, 1860.

"Outline of the geology of part of Venezuela and of Trinidad," by G. P. Wall, Esq.,

"On the co-existence of man with certain extinct quadrupeds, proved by fossil bones, from various pleistocene deposits, bearing incisions made by sharp instruments," by M. E. Lartet.

CHEMICAL SOCIETY.

May 3, 1860.

"On zinc methyl," by Mr. J. A. Wankyln.

"On the stibethyls and stibmethyls," by Mr. G. B. Buckton.

"On some derivations from the olefines," by Dr. Guthrie.

June 7.

"On the organo metallic bodies," by Dr. Frankland. The author considered these bodies as derivatives of metallic oxides or chlorides, in which some or all of the oxygen or chlorine atoms were replaced by organic radicles. In many of these bodies there were two distinct points of saturation, and sometimes the higher aud at others the lower point was the most stable.

LONDON ASSOCIATION OF FOREMEN ENGINEERS.

May 5, 1860.

"On the concussion of water in pipes attached to pumps," by Mr. John Briggs. Having briefly adverted to the progress made in hydraulic engineering generally during the last few years, and to a communication he had made to the Society on the subject some months back, Mr. Briggs proceeded to state that the more he had considered the subject the more had he become impressed with its importance. He had been engaged, too, in correspondence with a gentleman whose associations had induced the necessity of his devoting much attention to the subject of the concussion of water in the delivery and suction pipes of pumps. That gentleman was Mr. Naylor, of the Great Indian Peninsular Railway, and he had expressed a willingness to have his views placed before the Association for the information and criticisms of its members. Mr. Naylor stated that water as it was dealt with in force pumps generally might be considered as an inelastic fluid. It was a mere truism to say that all bodies put into motion had a tendency to continue in a straight direction until interfered with by some other power or force. Let us assume that we have a pump with a six-inch working barrel, and a three-inch rising main, and let us imagine also, for the sake of more clear illustration, that it is supplied with a clack valve of the exaggerated dimensions of six inches diameter, and having a lift of two inches. Then assuming that the velocity of the bucket is such as to keep the valve full open until it has reached the end of its stroke, it is evident in this case that as the valve had two inches to fall, the column of water in the rising main must fall eight inches without allowing for any water to have passed the valve while in the act of closing. The effect would be equivalent to that of a solid body equal in weight to the entire column of water falling eight inches. Here, then, is a momentum, and the valve strikes a blow upon its seat. Then follows a secondary effect from the fluid exerting its force in all directions, the one it was originally moving in being suddenly checked. Hence arises the noise, jarring of the pipes, and what is called concussion. By the application of an air vessel near to the pump and on the rising main, all other conditions remaining the same, and the bucket, as observed, moving sufficiently quick to keep the valve full open until it had completed its upstroke, it would be found that instead of water ascending the rising main, a magazine of power in the form of compressed air would be lodged in the air vessel, and this would give out its effect upon the column of water in the main while the bucket was descending, and thus cause a continuous and very nearly equal flow of water from the delivery pipe. This, then, would destroy the momentum, or, if you please, "concussion." The ordinary fire-engine, it may be said, gives a continuous flow, but the momentum does not in that case apply to our argument. Now, let us assume that the pump is worked slowly. An intermittent outflow will inevitably follow. The water will be "spurted" out with a rush, and the column will descend, partially filling the air vessel. What will be the effects, however, on the valve and pipes? It will be that though the water in the main descends almost as a solid body, yet it falls upon an air cushion, as it were, and its blow becomes a mere push until the compressed air is able to counterpoise its weight. In the upstroke of the bucket the air gives out its force again, and the water gushes forth as before spoken of. In meeting and mastering mechanical and scientific difficulties, we glean always valuable information, and an illustration of this fact may, perhaps, here be ventured on. A pump had been fixed in a well, and it had been intended that it should raise water to a height of 80 feet above its own level. Its diameter was six inches, and the rising main was four inches in diameter. No expense had been spared in its construction or the mode of fixing it, yet something or other connected with it was continually out of order. Sometimes the joints became leaky, then the framing worked loose, and, in short, difficulties were of constant occurrence. How to overcome this was the point. In the first instance, one of Naylor's piston pressure-gauges was fixed on the branch pipe leading to the rising main. When the pump was at rest and the main full of water, the gauge indicated a pressure of 36 lbs. per square inch. When the pump was in motion, however, and the bucket had reached the top of its stroke, the gauge indicated 150 lbs. pressure. This was the effect of concussion. An air vessel was now placed between the pump and the main. The column when at rest, of course, gave the same indicated pressure as before, but when the pump was started and worked at 30 strokes per minute, the gauge showed in place of 150 lbs. pressure an almost uniform force of 50 lbs. only, and the water was delivered steadily into the tank above! Slow working gave oscillations to the gauge varying from 25 to 75 lbs. on the inch and intermittent deliveries. The concussions in each case were got rid of, and it was long before further repairs were needed. The advisability, nay, the absolute necessity of attaching vacuum chambers to suction pipes of pumps where those pipes have to travel far in a horizontal direction, was next shown by Mr. Briggs, and confirmed by Mr. Naylor, who instanced two cases in point. In one, the suction pipe was 3,845 feet in length, and had 17 feet perpendicular lift, whilst in the other its length was 2,100 feet, and with 23 feet lift. The porosity of the iron of the pipes, together with imperfect joints in both, induced the application of air pumps to extract the air at the foot of the pumps, and the latter afterwards worked as steadily as if they had been immersed in the water, instead of being three-quarters of a mile from it.

INSTITUTE OF BRITISH ARCHITECTS.

JUNE 4, 1860.

"On the origin and developement of the use of crypts in christian churches," by A. Aspitel, Esq.

INSTITUTION OF MECHANICAL ENGINEERS.

JANUARY 25, 1860.

THIS was the thirteenth annual general meeting, when the Report was read, showing a very favourable state of affairs in every way. The following papers were then read:—

"On an improved gas meter," by Mr. A. Allan, of Perth.

"On the application of super-heated steam," by Mr. J. N. Ryder, of London.

"On Giffard's injector for feeding steam boilers," by Mr. J. Robinson, of Manchester.

STATISTICAL SOCIETY.

MAY 15, 1860.

"On the statistics of the poor rate before and since the poor law amendment act."

CIVIL AND MECHANICAL ENGINEERS' SOCIETY,

JUNE, 7, 1860.

"On screw propulsion," by Mr. J. J. Platts.

GEOLOGISTS' ASSOCIATION.

JUNE 4, 1860.

"On the flint implements lately found in the drift," by Mr. Mackie, F.G.S.

MONTHLY NOTES.

MARINE MEMORANDA.

During the month of May the number of wrecks reported was 124. In the month of January there were 229, in February 154, in March 166, and in April 133, making a total during the present year of 806.

Messrs. Caird and Co., of Greenock, have launched two tug steamers, named the *San Joaquim* and the *San Enrique*. They are 80 ft. in length, 16 ft. beam, and 8 ft. deep, and are to be propelled by a pair of diagonal engines, each of 30 horse-power. The steamers will shortly leave for Cadiz.

The *Giraffe*, a steamer just completed for the Glasgow and Belfast trade by Messrs. J. and G. Thomson, of Clydebank, Govan, is expected to attain a speed of 20 miles an hour, and will enable persons to visit Belfast from Glasgow and return the same day.

Messrs. W. Denny and Brothers, of Dumbarton, have contracted with Messrs. J. and A. Allan, of Glasgow, managing owners of the Montreal Ocean Steam Navigation Company, to build two new screw steamers, each of 2,500 tons register and 400 horse power. These vessels are intended for the Liverpool and Canadian trade.

In the year 1859, 249,527 tons of coal were purchased by the Government for the use of her Majesty's navy, without reckoning casual purchases made by captains of ships where there are no naval depots of coal. 188,507 tons were Welsh coal, and 61,020 tons north country coal. There is commonly three times as much Welsh coal taken for the navy as north-country coal.

The earliest pioneer steamboat, the *Charlotte Dundas*, now lies a "sheer hulk" in a basin of the Forth and Clyde Canal, near Falkirk. Various published drawings have made this great production of Symington well known to the world, and most of our readers must have smiled at her curiously geared stern paddle-wheel, her brick funnel and her two rudders. But in her, Symington accomplished a great feat, and we think that a museum would be a somewhat fitter resting place for her than an open canal.

A scheme has now been fairly organized for raising the sum of £2,500,000, under a French guarantee of 5 per cent., for the construction in this country of ten vessels, each of 6,000 tons register, or 10,000 tons builder's measurement, to be ultimately employed as a steam line between France and the East. It may well be asked what are these ships to be engaged in before they take up their station on the intended line; and it may very properly be questioned as to how the novel movement will affect Great Britain.

The *Inca*, paddle-wheel steam-vessel, of 400 tons, and 100 horse-power, built and fitted with machinery by Messrs. John Laird, Sons & Co., of Birkenhead, left early in May for Para. Accounts have been received of her safe arrival at St. Vincent, Cape de Verds, after a good passage, and having consumed less than eight tons of coal in the 24 hours. The engines of this vessel are fitted with many improvements for the purpose of economizing fuel, an object of the greatest importance on the river Amazon, as well as on all foreign stations; and the result of her voyage out has been looked to with considerable interest.

Iron shipbuilding on the Tyne is brisk. Messrs. Palmer and Co. have undertaken to build by October or November next two vessels, each of 2000 tons burden and 200 horse-power nominal. These ships are destined to take out the telegraphic cable, weighing from 4000 to 5000 tons, which is to be laid between Singapore and Rangoon. The Messrs. Palmer have undertaken the building and carrying contract, and will have their ships ready by the time already mentioned for taking the cable on board. The building of these ships, of the sister to the *Connaught*, and of the ponderous iron frigate for the Government, and the fulfilling of other contracts by Messrs. Palmer, is giving employment to above 2000 hands.

The *Ly-ee-Moon* steamer, just built by the Thames Shipbuilding Company, and fitted by Messrs. Seaward & Co. with engines designed by Mr. W. C. Taylor, Birkenhead, and constructed under his superintendence at Orchard Yard, Blackwall, on being tried, attained a speed under steam alone, of 16½ knots, or above 19 miles an hour, in still water. She is of 1000 tons burden, and 350 nominal horse-power, and has been built for the China trade. She is 270 feet long on the water line, and in breadth, moulded, 27 feet 3 inches, the mean draught of water being 12 feet, her actual displacement being 1317·7 tons, whilst her displacement per inch between light and load lines is 12·74 tons; the area of the midship section is 282·6 feet. The engines are a pair of oscillating cylinders, each 70 inches diameter, and stroke 5 feet 6 inches. The boilers are intended to work at 25 lbs., and are fitted with Beardmore's superheating apparatus. The paddlewheels measure 22 feet diameter, the reefing floats being 10 feet long by 4 feet 2 inches deep, giving 17 feet 6 inches diameter for the effective centres of floats, or 8 feet 9 inches from centre of wheel to centre of floats. The engine room is fitted with every modern contrivance for registering or recording all facts connected with the performances of the engines.

The preliminary trial trip of the magnificent steamship, *Connaught*, one of the fleet of the Atlantic Royal Mail Steam Packet Company, took place under circumstances which proved that in a more favourable state of the weather the expectations of her builders will be fully realised in the attainment of a speed of 20 miles an hour. The directors of the Atlantic Company may well be proud of the ship in which they propose to inaugurate their great undertaking of effecting a permanent communication between Europe and America by Galway. The *Connaught* is 380 feet in length by 40 beam, of a registered tonnage of 3000, but an actual tonnage of 4500. Her engines, by John Palmer, of the firm of Palmer, Brothers, and Co., of Newcastle, are of 800 nominal horse power, working up to 3500, oscillating, three cylinders abreast seven feet stroke, 80 inches in diameter. Two of Galloway and Beardmore's superheating apparatus are attached.

The paddles—Morgan's Patent—are 33 feet in diameter. The interior of the ship fitted up with the utmost attention to the comfort of passengers, and it was observed during the trip, notwithstanding the heavy sea running, that the tremulous motion so disagreeable to landsmen was scarcely perceptible. In spite of a high wind the *Connaught* without any difficulty or strain upon her engines, made 17⅜ miles per hour in a run of 46, and there is every reason to believe that on the "official trial trip," which will take place immediately, she will attain a higher speed than has yet been reached by any ocean going steamer in the world. The *Connaught* will proceed to Kingstown previous to her being sent round to Galway where she will be placed upon her station for regular packet duty.

At the half-yearly meeting of the Peninsular and Oriental Steam Company, held the other day, a dividend was declared at the rate of 7 per cent. per annum, free of income tax. The application of the superheating principle to the *Ceylon* has caused a considerable saving in coal, a question of great importance, the annual consumption of the company being now 300,000 tons against 200,000 tons two years ago, and the cost per ton having advanced from 40s. in 1858-9 to 51s. 7d. in 1859-60. To enable the company to divide 7 per cent. per annum, it is stated that the earnings must equal 30s. per mile on the total mileage, of which the subsidy, except on the Australian service, hitherto worked at a loss, will only make up 4s. 6d. A list of the fleet shows that the company possess 62 vessels, inclusive of one steamer building, and eight transport, store, and coal sailing ships, of an aggregate capacity of 82,911 tons, with 17,631 horse-power.

We subjoin a short table stating the number and tonnage of ships "entered inwards" at our ports in 1859, coastwise from the colonies, and from foreign ports, not adding the "clearances outwards" because they do not differ from the entries inwards sufficiently to make it necessary here to state both. The account is a satisfactory one. Entered inwards in 1859:—

	British.			Foreign.	
	Vessels.	Tons.		Vessels.	Tons.
Sailing Vessels.					
Coasting trade, ...	123,228	9,300,084	...	446	71,554
Colonial trade, ...	4,612	1,803,808	...	689	387,396
Foreign trade, ...	16,774	2,841,501	...	20,704	3,876,581
Steam Vessels.					
Coasting trade, ...	30,021	7,245,073	...	—	—
Colonial trade, ...	747	173,020	...	—	—
Foreign trade, ...	5,642	1,838,730	...	1,253	391,523

In the port of London the entries inwards amounted in the year to 5,934,996 tons, in Liverpool to 3,915,714 tons. The statistical abstract, apparently including only the foreign and colonial trade, states that the total tonnage (sailing and steam), reckoning both the entered and the cleared, with cargoes or in ballast, at the ports of the United Kingdom in 1859 was 13,311,843 tons of British shipping and 9,592,416 of foreign, being an increase upon the previous year of 420,438 tons of British shipping and 173,840 tons of foreign.

In the year 1859, 939 vessels, of 185,970 tons, were built and registered in the United Kingdom. This is above the average of the years 1845-54, but less than in any year since 1854; less than in 1858 by 61 vessels, and the tonnage by 22,110 tons; but the fact is, that in 1855 a very great increase of ship-building began, and that extraordinary increase is not now maintained. Of the build of 1859, 789 (of 147,967 tons) were sailing vessels, and 150 (of 38,003 tons) steam-vessels; and again classifying them, 34 of the 789 sailing vessels, but 106 of the 150 steamers were of iron. In addition to these home-built vessels there were also registered here, in 1859, 18 colonial-built vessels, (British North American) of 8,292 tons, and 60 foreign-built vessels, of 15,840 tons. On the other hand, 671 vessels belonging to the United Kingdom, of 170,487 tons, were wrecked, and 23 more, of 8,775 tons, broken up, so that the bulk of the new build is absorbed in replacing wrecks. At the close of the year there stood registered in the United Kingdom, including the Isle of Man and Channel Islands, 27,602 vessels, of 4,663,181 tons. The following table will show at a glance how this aggregate of our mercantile marine is made up, and we add a like account of vessels registered in the colonies also at the end of the year 1859:—

	Sailing Vessels.			Steam Vessels.	
United Kingdom,	Vessels.	Tons.		Vessels.	Tons.
Not above 50 tons,.........	9,680	297,197	...	761	17,313
Above 50 tons,..............	16,004	3,929,148	...	1,157	419,523
	25,684	4,226,345		1,918	436,836
Colonies.					
Not above 50 tons,.........	4,751	129,616	...	96	2,974
Above 50 tons,..............	4,201	638,012	...	182	27,077
	8,952	767,628	...	278	30,051

Comparing ports with reference to the vessels registered here, of sailing vessels not above 50 tons, 678 (23,216 tons) belong to the port of London, and 276 (9,804 tons) to Liverpool; but of those above 50 tons, only 1,825 (687,407 tons) belong to London, and 1,928 (900,531 tons) to Liverpool. Of the steamers 516 (188,220 tons) belong to London, and only 204 (58,786 tons) to Liverpool. London is ahead in number of ships, Liverpool in amount of tonnage.

At a recent meeting of the Royal National Life Boat Institution, Mr. Thomas Chapman, F.R.S., in the chair, a communication was read from Sir Charles Phipps, stating that he had been commanded by Her Majesty the Queen to say that she had accepted a beautiful photograph of one of the lifeboats of the institution, supposed to be proceeding off to a wreck on the east coast. It had been taken from a fine picture painted by Mr. S. Walters, of Bootle, near Liverpool. Her Majesty has been the kind patroness of the Lifeboat Institution from her accession to the throne. The Lowestoft lifeboat, which is in connection with this society, had during the late hurricane been instrumental in rescuing the crew of two wrecks—eight men from the brig *Scotia*, of Sunderland, and five persons, consisting of the master, his wife, daughter, son, and an infant, from the sloop *Three Brothers*, of Goole. Rewards amounting to £38 were voted by the institution to the crew of this lifeboat, and those of the Pakefield lifeboat for their laudable services during the fearful gale of the 28th ult. Thirty-five casualties had occurred in the neighbourhood of Lowestoft alone during that dreadful and sudden storm. It is supposed that between 300 and 400 wrecks have taken place during the hurricane of the 27th ult. and 2d inst., and that the number of lives that have perished from them have been proportionately large. On the other hand, it is gratifying to find that the services of the lifeboats have been in many instances of the most important character. A reward of £6 10s. was also voted to the institution's new lifeboat at Whitburn, near Sunderland, for putting off and saving the crew of four men and the master's wife, of the sloop *Charlotte*, of Woodbridge, which, during a heavy gale of wind was wrecked on the rocks near Whitburn lately. This lifeboat is called the *Thomas Wilson*, in memory of one of the benevolent founders of the National Lifeboat Institution. Rewards were also voted to the crews of the lifeboats of the institution stationed at Rhyl, Cahore, and Arklow, and to the crews of shore boats, for their laudable services in putting off to save life from various vessels that had signals of distress. A reward of £12 was also voted to the crew of the Brighton lifeboat, for assisting, in conjunction with the officers and men of the coastguard, during the late fearful storm, in saving, by means of the Manby apparatus, the crew, consisting of eight persons, of the brig *Transit*, of Shoreham, and seven men from the French brig *Atlantique*, of Nantes. A poor man while assisting with the crowd in drawing the lifeboat carriage along, slipped, and was killed instantly by its wheel passing over his body. The Institution voted £10 in aid of local subscriptions for his widow. The meeting expressed their deep regret that through some unfortunate dispute between the coxswain of the Yarmouth large lifeboat and some of the beachmen, the latter should have refused to man the boat, on a recent occasion, when 10 or 11 poor fellows were supposed to have perished from a wreck on the outlying sands. Fortunately, such disgraceful scenes are hardly ever, in the present day, to be witnessed on the coasts; indeed, the difficulty often experienced by the National Lifeboat Institution is to keep out volunteers from its lifeboats when once the signal of distress has been heard or seen. A contribution of £275 was announced at the meeting from the Royal Victoria Yacht Club towards the cost of the Isle of Wight lifeboat stations. An interesting communication was read from the clerks and workmen in the employ of Messrs. Ransome and Sims, of Ipswich, stating that they had forwarded £21 to the National Lifeboat Institution, and expressing a hope that other large establishments would follow their example in contributing to so valuable a society. Colonel Talbot Clifton was elected a vice-president of the institution. Payments amounting to £309 having been made on various lifeboat establishments, the proceedings closed.

In mechanics nothing is more difficult than to discover exactly the small turn which converts what is theoretically perfect into what is practically useful.—*Edinburgh Review.*

The power of making new mechanical combinations is a possession common to a multitude of minds, and by no means requires talents of the highest order. The great merit and the great success of those who have attained to eminence in such matters, were almost entirely due to the unremitted perseverance with which they concentrated upon the successful invention the skill and knowledge which years of study had matured.—*Babbage's Economy of Manufactures.*

Street Railway Conveyance in Paris.—M. Jules Viard, a French engineer, has submitted to the Emperor Louis Napoleon, a plan for a new railway waggon for the conveyance of passengers through Paris. The carriage has eight wheels; it is thirty feet long and nine feet broad; four horses are sufficient to draw it. Each carriage will accommodate 100 passengers inside and as many outside, with a roof on top for winter, and which may be removed in summer. The fare for each inside passenger to be 10c. (1d.), outside half-price. The rails are to be placed on the ground occupied by the old wall of Paris.

Our Coinage.—The total amount of gold, silver, and copper monies coined at the Royal Mint since 1843, has been £88,999,488, or at the rate of £5,235,264 annually. Of this amount £83,029,971 has been in gold, £5,764,058 in silver, and £205,459 in copper. The largest gold coinage in any one year was in 1853, £11,952,391; the largest silver coinage in 1853, £701,544; and the largest copper coinage in 1854, £61,538. The amount of gold coined in the eight years embraced between 1852 and 1859 inclusive, has been £48,598,013, against £30,031,547 coined between 1843 and 1850. Since the gold discoveries in Australia, in 1851, there has consequently been an increase of about 60 per cent. in our gold coinage.

Rapid Iron Smelting.—The produce of the Barrow Hœmatite Iron Works, near Ulverstone, North Lancashire, is something remarkable even in these days of energy. In these works, the property of Messrs. Schneider, Hannay and Co., the production of three furnaces, during 28 days, was no less than 3491 tons of this superior Hœmatite iron. The result of the four weeks' produce being, No. 1 furnace, 1064 tons; No. 2 furnace, 1152 tons; No. 3 furnace, 1275 tons; in all, 3941 tons; and during the last fourteen days, No 3 furnace has made no less than 661 tons of splendid iron. The proprietors are erecting another furnace, and it is said that they will be enabled to produce 330 tons of iron per week from each furnace, or when the four furnaces are at work, 5280 tons per month.

Great Equatorial Telescope.—In this country private enterprise has been so often proved to be in advance of government or officially authoritative movements, that we need hardly recur to the subject here, were it not that we have an excellent ease in point to relate. Greenwich Observatory is known and reverenced throughout the wide world. Its site is a point to which the savage and the civilized man alike turn, in those calculations by which alone a vast proportion of the world's business can be carried on. In Mr. Lassell's private observatory, near Liverpool, however, there is an equatorial telescope very far superior to anything which Greenwich can show. Even the new instrument in the Royal Observatory is eclipsed by it. The diameter of the speculum of Mr. Lassell's instrument is 24 inches, and its focal length is 20 feet. Mr. Lassell deserves well of his country for erecting so magnificent an aid to the human eye in viewing the heavens.

Velocity and Statical Pressure of the Wind.—From some observations made at Liverpool during the late gales, it was found that on one occasion at midnight, the velocity of the wind was 47 miles per hour; between 2 and 3 o'clock it was 46 miles per hour; and it gradually decreased until between 10 and 11 next day, when it was at its lowest point—15 miles per hour. Between 11 and 12 o'clock on the night first named it had risen to 27 miles per hour, but it gradually fell again to 19 miles per hour between 1 and 2 o'clock, when it rose to 32 miles between 2 and 3 o'clock, and from 3 to 4 the gale would appear to have reached its height, the velocity of the wind at that time being 59 miles an hour. This rate gradually sank to 39 miles between 3 and 4 in the afternoon, and between 7 and 8 it had fallen to a velocity of 31 miles an hour. The gale for a considerable period was one of the steadiest on record. At a little before 3 o'clock, the registered pressure was about 14 lb. to the square foot. It may be mentioned that on the 25th of December, 1852, the velocity of the wind being 70 miles, the pressure was 42½ lb. to the square foot, and that the greatest gale known at Liverpool was on the 27th of December, 1852, when the velocity of the wind was 71 miles, and the pressure 43 lb. to the square foot. The highest velocity attained now, as we have already stated, was 59 miles, while in the great gale during which the Royal Charter was lost it was but 55 miles, and the pressure was 28 lb. to the square foot.

Shoe Making by Steam.—The energetic attempts of Mr. Julian Bernard to produce boots and shoes in this country by steam machinery have often been noticed in our pages. Now it appears that our American friends are hard at work with a similar object. At Haverhill, Massachusetts, there is a steam shoe factory for sewing the seams and pegging shoes. In the basement of the building are the machines for cutting, stripping, rolling and shaping the soles. These are then passed to the storey above, where the shoes are lasted, and the outer sole tacked on by hand, which process prepares them for pegging. The pegging machines are simple in their construction and mode of operation, but perform the work with great despatch and accuracy, driving the pegs at the rate of fourteen a second. One of the most curious operations of the machine is the manner in which it manufactures the peg for its own use. A strip of wood of the required width, and neatly laid in a coil one hundred feet in length, is put into the machine, and at every revolution it is moved forward, and a peg cut off and driven into the shoe. The rapidity and unerring accuracy with which these machines perform their work is truly astonishing. After being pegged, the shoes are passed up to the third storey, where the bottoms are smoothed, scoured, and brushed. The fourth storey is occupied by the stitching machines attended by females, but run by steam, which saves a laborious and fatiguing operation.

Large Photographs in America.—Prof. Lutly, a Swiss philosopher some-time ago executed a very large and most elaborate drawing in pen and ink, entitled "The past and present of the United States;" showing New York in 1640, and New York in 1860, with portraits of some of the great men of the country. The drawing was executed for Mr. Meyer, of New York, who paid the artist £520 for it, besides supporting his family during the two years spent upon it. The drawing measures 36 by 28 inches, and it is said to be as faultless in detail as the best line engraving. At the desire of Mr. Meyer, this work has since been photographed full size, by Mr. Ceileur, and he has succeeded in the most perfect manner in carrying out his views. He used one of Harrison's orthoscopic lenses, of 2½ inches diameter, the aperture for the light being only ¾-inch diameter. It may be imagined that manipulating a plate 30 by 38 inches was no easy task. He was obliged to lift the plate from the bath alone, and could take it out only by pressing the palms of his hands against either edge of the glass, and in so doing he frequently cut his hands badly. He uses more than a pound of silver every day. He made *thirty-six* negatives before he commenced to print—every one of them equally good and perfect. Two men assist him to hold each plate—which weighs thirty-five pounds—while it is being coated, and he first moves the elbow of one, then the other, until the proper positions are attained. He has contracted to deliver several thousand prints from his negatives. The time required to take a negative is only thirty seconds. It requires an-hour-and-a-half to print a picture, and he can print one hundred and twenty in a day in fine weather. He uses two pounds of collodion to coat each plate. He has thirty-six plates, each of which cost above three guineas, or some £110 for the whole. He uses 120 grains of silver to the ounce of water—a pretty strong bath if his silver is pure.

Sleeping Carriages on Railways.—The Hudson River Railway, in America, can now boast of possessing the only satisfactory plan of sleeping carriage yet proposed or tried on any line. Two of the new carriages are now at work on the line. The leading points of improvement in them embrace the thorough ventilation of the carriage, complete exclusion of dust, and an arrangement by which every four seats are converted into a state-room, which renders a family of four almost as complete as if they were under the lock and key of their own state-room on a steamboat. In fact, the carriages throughout is simply a steamboat saloon on wheels. The roof is raised in the centre, and in the sides of the elevated part are inserted twenty-eight ventilators, which preserve the air pure and sweet, and keep up a steady and healthful circulation—a desideratum which has long been desired, but which, until now, has never been supplied. The system of seats and berths is not unlike that already in use. By day the mattresses and pillows are tucked away beneath the cushions, the cane-bottomed berths rest on their ledges at the top of the carriage, and four seats are all that meet the eye. By night, these are ingeniously brought together, and turned into a double bed, while still another tier of horizontal accommodations mysteriously finds its way into existence, three feet above, and offers its downy temptation to the unprovided voyager; the whole being enclosed by a curtain, which throws its protecting folds around the sleeping inmates within. In addition to these state-rooms, which are paid for at the rate of two shillings a berth, there is at the end of the carriage, a ladies' dressing-room, where are all the conveniences of the toilet, and everything necessary as a prelude to a breakfast, but the meal. The floor is constructed of two layers with sawdust between, to deaden the sound of the wheels, and for a similar purpose and to exclude the dust, the windows are likewise duplicated. The cost of each carriage is about £700.

Measurement of the Chemical Action of Light.—Nothing in photography can exceed the great importance of the establishment of accurate means of measuring the chemically active rays, as a step towards attaining a knowledge of the fundamental laws regulating photo-chemical actions; of which, notwithstanding the great progress made in practical photography, we know as yet hardly anything. By the rise of the chemical photometer the amount of chemically active light emanating directly from the sun has been accurately measured. It appears that at two different times on the same day the rays contained in direct sunlight are capable of producing equal chemical effects, when the sun is at the same height above the horizon and the sky is cloudless; thus the chemical action produced by direct sunlight alone at nine a.m. and at three p.m., at eleven a.m. and one p.m., &c., is the same. The chemical action effected by the whole diffused daylight has likewise been measured, the amount produced at an equal distance before or after noon being likewise the same. These statements are only true where the whole of the direct sunlight or diffuse daylight from a perfectly cloudless sky is examined. Photographers working in covered rooms with various aspects must naturally arrive at totally different conclusions. The laws regulating the variation of the photo-chemical intensity of direct solar and diffused daylight with the height of the sun above the horizon, afford us the means of drawing many most interesting conclusions, thus, for instance, it is seen that every point upon the earth's surface, where the sun does not rise beyond a certain height, the chemical action produced by the total diffuse light is, during a part of the day, greater than that produced by direct sunlight. When the sun rises beyond this height the direct sunlight effects a greater chemical action than the total diffused daylight, and between these situations there is a time when the chemical energy of these two sources is equal: this point is called the phase of equal chemical intensity. There exists a strong necessity of having a simple and accurate method for registering the daily and yearly variation of chemical light falling from the sun upon the earth, not only as affording to photography a great help, but as furnishing important data towards an entirely new field of meteorological research.

Royal Agricultural Society of England.—This great society consists at the present time of 72 life governors, 119 annual governors, 927 life members, and 4,047 annual members, making a total of 5,165 names on the list. The finances of the society have on no former occasion been in so favourable a condition. The dividend on the estate of the late secretary amounts to £970 11s. 10d., being at the rate of 10s. 11½d. in the pound, which has been paid in to the society's bankers. The funded capital, which stood at £10,000, has been raised by further investments to the amount of £12,000 in the new three per cents. The council have elected Professor Voelcker, the society's consulting chemist, to be an honorary member of the society. The consulting chemist is engaged in investigations on the following subjects:—Field experiments on wheat, barley, and turnips; the action of simple saline compounds on the soil; the feeding value and composition of mangold pulp; the chemistry of cheese and butter. The council having determined to select a literary and scientific editor of the society's journal, have appointed Mr. Philip H. Frere to that office, and from the high testimonials exhibited by that gentleman, feel confidence in hoping that he will succeed in conducting the society's publications with efficiency and talent. The arrangements for the Canterbury meeting to be held during the week commencing the 9th of July, are proceeding satisfactorily. The implement yard will contain nearly a mile-and-a-quarter of shedding, in addition to a very large entry of machinery in motion; and the entry of stock which has closed, is very large. The council, in the spirit which has guided them on former occasions, and considering the cordial reception which awaits them in the county of Kent, have thought they could not do otherwise than defer to the strongly expressed wishes of the locality that this special opportunity should not be lost for directing attention to the agriculture peculiar to the district, and have been induced to accept the offer of a considerable sum to be distributed in prizes for ploughing on the Kentish or turnrise system, as also for hops, wool, and certain breeds of live stock. The council have decided, subject to the usual conditions, to hold the society's country meeting next year at Leeds, for the district comprising the three ridings of Yorkshire. Great anxiety was evinced by many localities in the county to be selected as the place for the country meeting; but the advantages of Leeds and its neighbourhood, joined to the eligibility of the sites offered for show-yards and trial-fields, have induced a decision in its favour, which, it is confidently hoped, will result in a most successful meeting.

Straw Paper.—The manufacture of paper from other materials than rags is, more than ever, an important question of the day. Straw paper cannot yet be said to have attained the superior qualities of rag paper; it is, indeed, deficient in many respects, more especially by its brittleness. Dr. Reissig has, however, lately published, in the German papers, the whole details of a process he employs, or has employed, with success, and by which very good paper is produced from straw. It is more than suspected that the straw paper manufactured up to the present day owes its inferiority to want of care, and to great rapidity in its preparation. Dr. Reissig seems aware of this:—The first operation consists of cleansing the straw and freeing it from the stalks of any other plants, which are generally very difficult to bleach. It is then cut up into fragments, about one-third of an inch in length. The knots are separated from the other portions of the stalk by means of a fan, and the latter are submitted for some time to the action of steam, to dissolve out all the extractive matter; this operation is continued as long as the water which condenses is coloured, and until the straw is quite soft. The operation is accelerated by the addition of about 10 per cent. of caustic lime. Dr. Reissig says that superheated steam gives the most satisfactory results. The straw is then placed in a boiler and submitted to the action of 12 lb. to 16 lb. of carbonate of potash in solution to every ton of straw (experiments appear to show that soda does not act so well). After boiling for some hours, the potash solution, having dissolved the silica of the stalk and various other matters, is separated, and the straw, which has now become soft and flexible, well washed and carried to a mill, where it is transformed into pulp. When the action of the potash solution takes place under a pressure superior to that of the atmosphere, comparatively small proportions of alkali readily dissolve out all the silica from the straw. The pulp obtained is transferred to wooden troughs, and to it are added 4 or 5 per cent. (of the weight of pulp) of sulphuric or hydrochloric acid. The action of the acid must be allowed to continue for many hours, as it takes a long time to mix with the water contained in the pulp. The acid water is then drawn off, and can be employed in the subsequent operations. The bleaching material is then added; it consists of hypochloride of magnesia, obtained by precipitating 1 part of chloride of lime dissolved in 12 parts of water, by 2 parts of sulphate of magnesia dissolved in 12 parts of water. The sulphate of lime is allowed to deposit, and the hypochlorite of magnesia carefully decanted off. In two or three hours the pulp is completely whitened. It is then washed with care, and any free chlorine it may contain absorbed by sulphate of soda. A last washing now takes place, after which the pulp is divided, sized, and submitted to the paper machines.

Our Textile Materials: Cotton and Wool.—In 1854 we imported 887,333,100 lb. of raw cotton, and their computed real value was £20,175,395; in 1855, 891,751,952 lb., at £20,848,515—comparatively not a very striking difference. But in 1856, when we imported as much as 1,023,886,304 lb., their computed real value rose to £26,448,224; and, in the next year, when we only received 969,318,896 lb., their computed real value or price was no less than £29,288,827. In 1858 we imported 1,034,342,176 lb., not so very different from the quantity of 1856, but the computed real value (though not by any means so high in proportion to quantity as in 1857) was £30,106,968. In 1859 the import was 1,225,989,072 lb., and the computed real value £34,559,636, again showing an improvement. It is of interest to notice the proportion that the value of the exports bears to the value of the raw material imported, only recollecting that that raw material serves not only to make up these exported goods, but also the goods used at home. In 1854 the computed real value of the raw cotton imported was £20,175,395; the declared real value of the cotton exports was £31,745,857—a difference of £11,570,462 in our favour. In the subsequent years this difference, or excess of the value of our cotton exports over the entire import of raw cotton (whether for home goods or for exports) has been, in 1855, £13,930,626; in 1856, £11,784,517; in 1857, £9,784,593; in 1858, £12,894,354; in 1859, £13,642,589. The importation of cotton into this country has, since the import duty was abolished, increased sixteen-fold. Having been 63,000,000 lb., it is now 1,000,000,000. This is one of those giant facts which stand head and shoulders higher than the crown—so high and so broad that we can neither overlook it nor affect not to see it. It proves the existence of a thousand smaller facts that must stand under its shadow. It tells of sixteen times as many mills, sixteen times as many English families living by working those mills, sixteen times as much benefit derived from sixteen times as much engaged in this manufacture. Upwards of 500,000 workers are now employed in our cotton factories, and it has been estimated that at least 4,000,000 persons in this country are dependent upon the cotton trade for subsistence. A century ago Lancashire contained a population of only 300,000 persons; it now numbers 2,300,000. In the same period of time this enormous increase exceeds that on any other equal surface of the globe, and is entirely owing to the developement of the cotton trade. In 1856 there were in the United Kingdom 2,210 factories, running 28,000,000 spindles, and 299,000 looms, by 97,000 horse power. Since that period a considerable number of new mills have been erected and extensive additions have been made to the spinning and weaving machinery of those previously in existence. The amount of actual capital invested in the cotton trade of this kingdom is estimated to be between £60,000,000 and £70,000,000 sterling.

Last year's imports of wool exceeded those of any previous 12 months, having reached a total of 133,284,684 lb. against 126,738,723 lb. in 1858, and 129,769,898 lb. in 1857. In 1843 the importation was only 49,243,093 lb., so that the receipts have increased about 170 per cent. in 17 years. In 1843, 28,164,731 lb. were imported from foreign countries, or 57 per cent. of the total imports; and in 1859, 50,951,346 lb., or 38 per cent.; so that England is now less dependent on foreign nations for wool than she was in 1843. The progress made in the growth of wool by the leading British colonies has been extraordinary. South Africa sent us 1,728,453 lb. in 1843, and 14,269,343 lb. last year; British India supplied 1,916,129 lb. in 1843, and 14,363,403 lb. last year; and the Australian settlements, which exported 17,433,780 lb. in 1843, last year attained a total of 53,700,542 lb. The supplies fell off somewhat last year from South Africa and India as compared with 1858, but the Australian total has never been exceeded in any former year. In 1851, when gold was first discovered in the "great south land," it was feared that the social convulsion which ensued would materially curtail the export of wool; but these anticipations have proved groundless, the supplies having been 41,810,117 lb. in 1851, and 53,700,542 lb. last year. The wool exports of Australia advanced continuously every year from 1846 to 1856, having been 21,789,346 lb. in the former, and 52,052,139 lb. in the latter year. The two succeeding 12 months were periods of depression, but for many years to come the pastoral interest of Australia will no doubt enjoy an onward career of progress and prosperity. It is not so with Spain and Germany, who now positively send us less wool than in 1843. These facts show very strikingly the gigantic scale on which our textile manufactures are conducted.

Crompton, the Inventor of the Spinning Mule.—The 3d of December, 1753, was rather a notable day in our social history. In the morning seven felons were hanged at Tyburn; in the evening a prize of £10,000 was drawn in the State lottery; while at some unchronicled hour in the day, in a farmhouse at Firwood, near Bolton, Betty Holt, the wife of one George Crompton, farmer, carder and spinner, brought her only son into the world. The twelve months immediately preceding and following that apparently insignificant birth were rich in social events. The Society of Arts was founded; the British Museum established; the Society of Antiquaries was incorporated by royal charter; the New Style was definitively arranged; Benjamin Franklin discovered natural electricity, and Clive began the conquest of India. But of all these events the birth of that poor farmer's son was destined to be of the most importance to mankind.

The Bolton of that day was very different from the Bolton of the present day. No tall chimneys or giant manufactories darkened the air or blackened its waters then; but long green bleaching meadows sloping down to the Croal—as yet a pure stream with trout and grayling in its quiet pools, and marsh marigolds and water violets on its banks, left quite a rural beauty fresh upon the land. In every house stood the old-fashioned spinning or carding machine; and every man was a small manufacturer in his own right. Belfast sent the linen and cotton yarn, which the Bolton men and women wove into the calicoes and muslins, fustians, herringbones, crossovers, quiltings, and dimities, that were sent to market every Monday in wallets flung over the shoulder and balanced by baskets of eggs and butter, for the small manufacturer was most frequently a farmer as well, and spent the evening at his weaving when it had got too dark for hoeing or ploughing in the fields. The cotton goods then sent were just rough from the loom, and invariably unbleached; and the rugged Bolton men generally pitched their goods carelessly into the open street or piled them up under rude piazzas in front of the shops. There were warehouses and market-halls as well, but the open-air bargaining belonged to the time. The buyers arranged all about the bleaching, which was, however, always given to the Bolton men to do; and whosoever owned one of those long green crofts stretching to the Croal was pretty sure of plenty of work in bleaching and dyeing. Times have changed since then; since every man, no matter what his trade, worked at the weaving loom as well, and every field blossomed out into a bleaching-ground; since merchants travelled on horseback with pistols at their holsters and highwaymen ever before their eyes, and the manufacturers trudged ankle deep through mire on foot, with their goods strung up in wallets on their backs; and since men knew so little of the laws of health, and money was so scant of circulation, that one cow a week was the average slaughtering for the five thousand and odd hundred inhabitants of Bolton. Now, machinery has taken the place of men, yet more men are employed; manufacture and capital have centralized themselves into a few colossal centres, yet there is a wider flow of wealth, and a far wider flow of luxury and comfort; and where a few Boltonians feasted on that one hebdomadal cow, eighty or a hundred fat oxen scarcely satisfy the weekly appetites of the present generation. And all this change has been mainly brought about by that "wee bit wean" lying in its cot in the house of George Crompton, farmer, at Firwood.—*Athenæum.*

Manchester Association for the Prevention of Steam Boiler Explosions.—The following is an abstract by Mr. H. W. Harman, C.E., the chief inspector for the Association:—We have made 242 visits, examined 736 boilers and 524 engines; of these 2 visits have been special, 2 boilers specially, 23 internally, and 36 thoroughly examined; 37 cylinders have been indicated at ordinary visits. The principal defects met with during the month are as follows:—Fracture, 6, (1 dangerous); corrosion, 15, (2 dangerous); safety valves out of order, 40; water gauges, 13; feed apparatus, 4; blow-off cocks, 15; fusible plugs, 1; furnaces out of shape, 27, (3 dangerous); over-pressure, 1; blistered plates, 11; total, 147, (6 dangerous.) Boilers without glass water gauges, 6; ditto., pressure gauges, 8; ditto, blow-off cocks, 20; ditto., back pressure valves, 46. Other defects met with are of the usual character, and where necessary, have elicited from me by direct communication with the proprietors, such remarks and advice as the special circumstances of each case demanded, and I trust that my observations on insecurity of continuing to work boilers with internal flues out of shape, that is, that have partially collapsed from want of water, will meet with that attention the importance of the subject requires. Since our last meeting I have to report two cases of explosion of boilers in our immediate neighbourhood, both I regret to state accompanied by loss of life,—whilst in other parts of the kingdom, an unusual number of similar disasters have occurred, resulting in death and injury to a large number of persons. As far as I am enabled to judge from the public reports, the majority of these accidents appear to have been occasioned by the plates becoming so thinned by corrosion that they no longer possessed the requisite tensile strength to resist the ordinary working pressure. I am very decidedly of opinion that had the boilers in question been subjected to a periodical inspection, such as this association has so long afforded to its members, these calamitous events would in all human probability have been averted. In the position I occupy, I desire to avoid as much as possible making remarks that may appear as casting reflections upon others, but I cannot forbear from adding, in regard more particularly to those who have not joined us and who are placed within the scope of our operations, that the neglecting to avail themselves of the benefits to be derived from a competent periodical examination, does seem to me, a near approach to a wilful disregard of the obligations and the consequences of such fearful visitations, especially when under Providence, immunity, I had almost said, may be secured at the trifling charge of a guinea per boiler per annum, and which again dwindles into insignificance when compared to the property at stake, and the number of lives jeopardised. I would wish it also to be borne in mind that no other principle but the one of ascertaining by a careful, searching, and visible inquiry into the state of such things and their adaptibility to meet with safety the requirements of the owners, can be practically instrumental in warding off danger to human life. Boilers may be fitted with every known appliance that science can offer in order to show the conditions under which steam is generated, yet no mechanical device with which I am acquainted will serve to register the wear and tear boilers undergo, or the loss of strength incidental to the peculiarities of circumstances by which such things are surrounded, stringent inspection affording the only true test of safety and protection from disaster.

Advice to Students in Practical Science.—To such of you as are about to enter upon the scientific portion of your course, by the study of natural philosophy, chemistry, and natural history, I cannot resist the opportunity of offering a word of counsel and encouragement. Other departments of knowledge may, to some extent, be pursued in the closet, but it is only by the aid of well-devised apparatus, by the exhibition of instruments and specimens of natural objects, and by studying the productions of the material world in their own localities, that a sound and practical acquaintance with these sciences can be obtained. With such auxiliaries, a wide field of knowledge will be spread out before you, in which every fact you observe, and every truth you learn will surprise and delight you. Creations of boundless extent, displaying unlimited power, matchless wisdom, and overflowing beneficence, will at every step surround you. Fixed upon the pedestal of his native earth, and with no other instrument but the eye and the hand, the genius of man has penetrated the dark and distant recesses of time and space. The finite has comprehended the infinite. The being of a day has pierced backwards into primæval times deciphering its subterranean monuments, and inditing its chronicle of countless ages. In the rugged court and shattered pavement of our globe, he has detected those gigantic forces by which our seas and continents have changed places—by which our mountain ranges have emerged from the bed of the ocean —by which the gold and the silver, the coal, and the iron, and the lime have been thrown into the hands of man, as the materials of civilisation, and by which mighty cycles of animal and vegetable life have been embalmed and entombed. In your astronomical studies, the earth on which you dwell will stand forth in space a suspended ball, taking its place as the smallest of the planets, and like them pursuing its appointed path—the arbiter of times and seasons. Beyond our planetary system, now extended, by the discovery of Neptune, to 3000 million of miles from the sun, and throughout the vast expanse of the universe, the telescope will exhibit to you new suns and systems of worlds, infinite in number and variety, sustaining, doubtless, myriads of living beings, and presenting new spheres for the exercise of Divine power and beneficence. Ideas like these, when first presented to a mind thirsting for knowledge, are apt to disturb its equilibrium and unsettle its convictions. Should this be the mental condition of any of you, be not alarmed for its results. This species of scepticism is the infant condition of the uncurbed and generous intellect. There can be no firm convictions where there have been no perplexities and doubts, and that faith which comes in the train of early scepticism will finally rest upon an immovable foundation. Credulity, on the contrary, is the disease of feeble intellect, and ill-regulated minds. Believing everything, and investigating nothing, the mind accumulates errors, till its overgrown faith overmasters its untutored reason. Such a facility of belief may, in some cases, claim the sympathy even of philosophy, but when it spurns the strict demands of inductive truth, and plants imagination at the door of the temple of science, it cannot be too severely reprobated, or too sternly shunned. In the present day, when religion and philosophy are assuming such novel aspects—when the mysterious in Revelation is subjected to the scrutiny of philosophy, and philosophy herself straying into the labyrinths of mysticism, and claiming kindred with the supernatural—when the apostolic simplicity of Christian worship is marred by the glitter and the mummery of exploded superstitions, it is necessary to warn you against speculations morally and intellectually degrading. In the blue heavens above, in the smiling earth beneath, and in the social world around, you will find full scope for the exercise of your noblest faculties, and a field ample enough for the widest range of invention and discovery. Science has never derived any truth, nor art any invention, nor religion any bulwark, nor humanity any boon from those presumptous mystics who grovel amid nature's subverted laws—burrowing in the caverns of the invisible world, and attempting to storm the awful and impregnable sanctuary of the future.—*Sir David Brewster.*

Wood for Carriage Building.—The ash tree grown in England is used principally in the construction of carriages: of this, there are two kinds, known as wood grown and "hedge row." The former springs up rapidly without the access of air and light, and though straiter grained than the hedge row, is soft and not durable. The latter is of slower growth, but much firmer, tougher, and stronger than the other. American ash timber is principally of the former quallity, being grown in thick forests, remarkable for a moist atmosphere. For heavy framework the timber should be in the highest state of perfection—arrived at maturity, but not at the extreme size it is capable of attaining.

Ash is rather a tough and fibrous than an elastic wood, subject to be altered in form, by the application of pressure; and, therefore, when not in masses, requires iron plates to secure it. It becomes plastic by boiling, and if the thickness is not too great, will take any form required; but if over-boiled, the durability of the wood is impaired, as the gluten is then dissolved and the fibres separated. Steam is much less injurious than hot water, as it does not affect the gluten which binds together the fibres. Some ash timber at heart is white, and some red, the white is generally the best. Trees which have grown on hill sides and been exposed to continual winds, are the toughest of all ash timber of this kind, although it is wrinkled in appearance and most difficult to plane. All things being equal, that timber is the best which is cut when the circulation of the sap is slowest, as the pores then are more closed. One quality which renders ash valuable for carriages is the absence of elasticity, which does not render it so liable to warp, twist, or alter its form. Ash is not well adapted for boards or planks when width is required, though excellent for framing, as in drying it is apt to rend.

Beech should not be used for carriages, or for any work which may be exposed to air or moisture, as under ordinary circumstances it is liable to decay in a very short time.

Elm may be used for boards with great advantage, for which purpose hedge-row and wych are the kinds best suited. The wych elm is not so plentiful as formerly, and hedge row, therefore, constitutes the principal part of the supply. The grain is curly, wavy, and difficult to work, and, without great care, apt to split. The wych elm is more apt to split than hedge row, but forms a much better surface for paint. Elm is generally used for the naves of wheels.

Oak is used for the spokes of wheels, the best kind of which are made of the timber of saplings, grown in the south of England.

Mahogany is much used for panelling, particularly where it is required that an even surface of paint should be shown. The Honduras is the only kind applicable to carriage building, and is of sufficient dimensions for all purposes. The Patent Wood or Fibrous Slab Company are manufacturing, under Bielefeld's patent, a fibrous material much resembling in appearance papier mâché in the process of manufacture; the material, in a soft state, is passed through rollers, with canvass on each side, and is deposited of uniform thickness. This substance is calculated to answer the purpose where mahogany is inapplicable, as it can be moulded to an extreme double sweep, and procured of any width or thickness, and can be had at about the same price as mahogany,

Deal is a word which is generally used to describe a form, and not the quality of timber, and in this way is applied to the finest Petersburgh red wood as well as the commonest American spruce.

The wide American pine is the best in very thin boards, to form the covered pannels and roofing of carriages.

Fustic is the best wood we know of for the naves of wheels intended for tropical climates. French holm is also good.

Lancewood is much used for the shafts of two-wheeled vehicles, and is undoubtedly the best wood for the purpose.

American birch is valuable for boarding, on account of its width. It also works easily, and yields a good surface for painting; it is, however, not adapted to any work but what is intended to be straight.

Chesnut, sycamore, and walnut are now used for the same purposes as the above. Sycamore can be had from the continent in any quantity, and of very large size.

The Selection of a Fixed Pursuit.—Although the acquisition of general knowledge is a primary duty, and the confining our study within the narrow limits of one or two branches enfeebles the mind, impairing its powers, and even preventing an entire mastery of the selected branches, yet it is on every account highly expedient, indeed all but absolutely necessary, to single out one branch as the main object of attention. This selection is required by the impossibility of thoroughly mastering different unconnected kinds of knowledge, and the risk of distraction which passing from one subject to another occasions, the danger even of the greatest evil occurring, that of superficial learning, the rule being inflexible that no one subject or part of a subject must be studied without going to the very bottom, fully and accurately, of what he would learn —not proposing to ourselves, it may be, to go beyond a certain length, but as far as we profess and purpose to go, becoming thoroughly master of the subject.

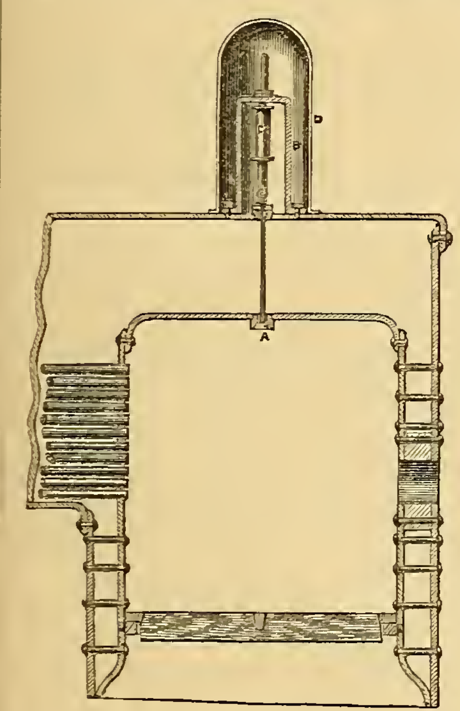
There is, however, another reason for selecting one especial branch; we thus draw as it were a meridian line to which all our steps in other directions may be referred. The acquisitions thus made derive additional interest from their connection with the principal and prevailing pursuits; the attention to these is kept awake, and the memory in proportion retentive of the accessory or subordinate matters, while they lend help and illustration to the main object of our study. That object is of engrossing though not exclusive interest; it does not preclude a moderate attention to others; but this selection, this singleness of entire absorption, is absolutely necessary to avoid the dispersion of the faculties caused by intemperate devotion to several subjects, whereof the certain tendency is to produce mediocrity in all, making ordinary capacity, even when united to great industry, yield but little return of value, and from the rarest endowments, which temperately and judiciously used might render the most important service, only obtaining the exhibition of varieties more wonderful than useful, like the displays of the mocking bird, which can warble all the notes that make the grove vocal, but has no song of her own. That genius is of universal application cannot be denied; but the interests of science, and generally of mankind, as well as of the individual, require that it should not be so applied.

The great lights of the world afford few, if any, exceptions, to this rule. Had Barrow's professional studies and his attention to the eloquence of the pulpit not interfered with his mathematical pursuits, he would probably—Fermal, but for his official duties and his general speculations, would certainly—have made the great discovery of the calculus, to which both had so nearly approached. What might not have been expected from the bold and happy conjectures of Franklin under the guidance of the inductive method, so familiar to him in all its rigour, had he not devoted his life to the more important cause of his country and her liberties? Priestley's discoveries, all but accidental, however important, were confined in their extent and perversely misapprehended in their results by the controversies, religious and political, which engrossed his attention through life. Descartes, instead of the one great step which the mathematics owe him, was destined to make vast progress in physical science, and not to leave his name known by a mere baseless hypothesis, had he not been seduced by metaphysical speculation; and Liebnitz, but for the same seduction, joined to his legal labours, would assuredly have come near the Newtonian system in dynamics, as he had preferred a just claim to share in its analytical renown.

On the other hand, mark the happy results of concentrated power in Bacon wisely abstaining from the application of his own philosophy when he found that previous study had not fitted him for physical inquiries; Newton, avoiding all distraction, save when he deemed his highest duties required some intermission of his habitual labours; nay, had Leonardo da Vinci indulged in the investigations of natural sciences, for which he possessed so remarkable a talent and has left such felicitous anticipations, his name as one of the first of artists would have been unknown; and had Voltaire prosecuted the study of chemistry, in which he was so near making two of the greatest discoveries, we should never have had the tragedies, the romances, and the general history, the foundations of his fame. But the same principle applies as well to active life as to the pursuits of science and letters. Every one should have a special occupation, the main object of his attention, to which all others are subordinate, and all more or less referable. With most men this is inevitable, because they are engaged in professional employment; but all ought to single out some pursuit, whether speculative or active, as the chief occupation of life.

Nothing conduces more to comfort and happiness—nothing is a greater safeguard against the seductions of indolence, or of less innocent, perhaps not less hurtful indulgence. Nothing gives a greater relish and zest to the subordinate pursuits. He who has professional duties has no right to call any hour not earned by the discharge of those duties his own, for other occupations whether of relaxation or even of mental improvement. His business is his master; but where there is no such servitude, I strongly recommend the voluntary forming of the relation between master and slave by the choice of a pursuit, and submitting to its claims upon our time and our attention as paramount.—*Brougham.*

Safety Apparatus for Boilers.—The accompanying engraving represents a vertical section of the fire-box end of a locomotive boiler, having applied thereto an apparatus for preventing the accidental explosion of the boiler. The apparatus in question is the invention of Mr. Matthew Jones, of Bute Docks, Cardiff, engineer to the Cardiff Steam Towing Company. In the crown of the furnace is fitted a valve, A, which opens inwards from the water space of the boiler. This valve is connected by a spindle which passes upwards through a stuffing box fitted in the boiler shell, and to which is bolted the saddle bracket, B. The valve spindle is connected to the lower end of the spring balance, C, the screwed spindle of which extends out through the bracket, B. By means of a nut on the spindle of the spring balance, its tension may be adjusted to the required degree of internal pressure which, it is intended, the spring should resist. The external part of the apparatus is fitted up under a lock-up dome, D, so that the adjustment of the balance cannot be interfered with. It is preferred to so adjust the spring balance that if, from neglect or any unforeseen cause, the pressure of steam should rise above five or ten pounds more than the adjustment of the ordinary external safety valve, the valve, A, will then open and quench the fire. This arrangement renders it impossible for the boiler to explode from internal pressure. When applied to marine boilers, the inventor prefers to place the apparatus in the crown or top of the turn-back tube plate, in order that it may command a range of furnaces and so quench the whole of the fires, upon its being brought into use. In stationary cylindrical or cornish boilers it may be arranged over any part of the fire, the spindle of the valve passing through to the outside on top. The arrangement is simple, inexpensive, and readily applied to all kinds of boilers; and it affords another element of safety which should not be disregarded.



The Atlantic Telegraph.—The Secretary of the Atlantic Telegraph Company announces that an attempt is being made to restore communication through the cable, 2,050 miles in length, and that an expedition has been sent out for the purpose. It is asserted that the wire may be lifted for any depth and examined. Intelligence has since reached Boston that some fifty miles of the cable has been raised, extending from the shores of Trinity Bay seaward. And what is highly interesting in a scientific point of view, is, that fractures were found in the cable just where they had been indicated by the instruments on shore.

The Results of Machinery.—Mechanical improvements on their first introduction sometimes beget injury to individuals, and even transitory inconvenience to society. But partial and transitory evil can be no solid objection to the introduction of general and permanent good. There is not the semblance of a reason why the welfare of the community at large should be sacrificed to the advantage of a few; or why a small and transient injury should not be endured for the sake of a great and lasting benefit.—*Samuel Bailey.*

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded February 8.

342. George A. Huddart, Brynkir, Cærnarvonshire—Improvements in apparatus for obtaining motive power.

Recorded March 15.

691. Marc A. F. Mennons, Rue de l'Echiquier, Paris—An improved arrangement of apparatus for working and controlling railway signal discs.—(Communication from Henri Petitpierre, Paris.)

Recorded March 30.

828. Robert Lakin, Ardwick, and John Wain, Manchester—Improvements in machines for spinning and doubling cotton and other fibrous substances.

Recorded April 11.

910. Jules F. Hillel, Mark Lane—Improvements in the apparatus and in the mode of treating Spanish grass and other fibrous materials, to be used in the manufacture of paper pulp.

Recorded April 13.

924. Adam Bamlett, Middleton Tyas, Yorkshire—Improvements in reaping and mowing machines, and in implements connected therewith.

Recorded April 14.

938. Laurent M. Boulard, Rue de l'Echiquier, Paris—An improved apparatus for preventing or destroying incrustations in steam boilers.

Recorded April 21.

1003. Edward Peyton and William F. Batho, Birmingham, Warwickshire—Improvements in the manufacture of metallic bedsteads.

Recorded April 23.

1010. Jules A. Philippe, Rue du Ponceau, Paris—A new process and apparatus for bleaching fabrics and substances that can be bleached, such as thread, textile plants, and paper pulp.

Recorded April 24.

1018. Louis Oriard, Chevirè Lerouge, France—Improvements in breech loading fire arms and in their cartridges.
1031. Robert Atkinson, Southampton Court, Tottenham Court Road—An apparatus to give warning to the inmates of a house or apartment, of the attempted entry of thieves or burglars, which may be called a burglar and thief detector.

Recorded April 27.

1058. James White, George White, John White, Hulme, Manchester—An improvement or improvements in machinery for pressing and cutting tobacco or other substances.
1059. Léopold D'Aubreville, Boulevard de Strasbourg, Paris—Improvements in the manufacture of metallic boxes or vessels used to contain preserved alimentary provisions or other substances, and in the apparatus and machinery employed therein.—(Communication from Alfred H. Remond, Place Vintimille, Paris.)

Recorded April 28.

1080. Henry J. Barr, Bombay—Improvements in working railway signals, and in apparatus employed therein.

Recorded May 2.

1106. William S. Jackson, Milton Street, Dorset Square—Improvements in the manufacture of soap.

Recorded May 3.

1114. Michael Henry, Fleet Street—Improvements in the mode of, and apparatus for propelling, turning, and changing the direction of ships, balloons, and other bodies.—(Communication from Louis Coignard, Boulevard Saint Martin, Paris.)

Recorded May 4.

1118. Timothy Railton, Manchester—Improvements in the apparatus employed in the manufacture of cap or bonnet fronts.

Recorded May 5.

1120. Charles Stevens, Welbeck Street, Cavendish Square—An improved means and apparatus for transporting and preserving live fish, and keeping water fresh for a long period.—(Communication from Jean C. Noel, Paris.)

Recorded May 8.

1138. Walter Evans, Derby—Improvements in machinery for polishing yarns and threads.
1140. Thomas M. Gladstone, London Street, City—An improvement in the construction and form of anchors.

Recorded May 9.

1141. George Scott, Ashburnham Terrace, Greenwich, Kent—Improvements in furnace or grate bars.
1142. Henry Kemp, St. Marylebone—Improvements in preserving wood, leather, iron, and other substances.
1144. Ellis Butterworth, Calder Cottage, Spotland, near Rochdale, Lancashire—Improvements in machinery for preparing and spinning cotton and other fibrous substances.
1146. James Reid, University Street—Improvements in electric telegraph conductors.
1148. John M. Fisher, Taunton, Somersetshire—Improvements in chimney tops or cowls.

1150. William E. Newton, Chancery Lane—Improvements in the manufacture of threads and yarns, and in the preparation of fibrous materials for such manufacture.—(Communication from George R. Sampson, Boston, Massachusetts, U. S.)

1152. James Howard, Bedford, and John Lilley, Astwood, Buckinghamshire—An improved construction of horse hoe.

Recorded May 10.

1153. William E. Gedge, Wellington Street, Strand—Improvements in breech-loading fire-arms.—(Communication from Joseph Humbertjean and Charles Matthey, Besançon, France.)

1154. Henry Wildsmith, Joshua Carter, James J. Carter, Batley, York—Improvements in extracting wool or other animal fibres, from combinations of wool and cotton, or mixtures of other animal and vegetable fibrous substances or fabrics, and in the machinery or apparatus employed therein.

1155. Richard B. Boyman, Park Crescent, Stockwell, Surrey—Improvements in applying steam or other expansive prime movers by action and reaction for rotary motion and propulsion, and in the machinery for the purpose.

1156. Frederick Edwards, Great Marlborough Street—Improvements in chimney bars or plates.

1157. Alexander Wilson, Edinburgh — Improvements in the construction of railway carriages, waggons, and trucks, which improvements are also applicable to vehicles for common roads.

Recorded May 11.

1158. George Price, Wolverhampton, Staffordshire—Improvements in locks.

1159. Frederick B. Doering, Ebury Street, Eaton Square—Apparatus for governing and regulating the speed of marine engines.

1160. John Macintosh, North Bank, Regent's Park—Improvements in artificial gums, and setting and stopping teeth.

1161. James Uttley and Joseph Bray, Staley Bridge, Cheshire — Improvements in machinery or apparatus for spinning cotton, wool, silk, flax, and other fibrous materials.

1163. Samuel Ridge, Hoviley Bridge, near Hyde, Cheshire—Improvements in the process of ageing printed woven fabrics.

1164. John Grantham, Nicholas Lane, William Synnock, Warkworth Terrace, and Lazarus S. Magnus, Adelaide Place—Improvements in the manufacture of wire rope, and in machinery for that purpose, with special application to the manufacture of telegraph cables.

1165. Richard A. Brooman, Fleet Street—Improvements in driving or propelling railway rolling stock.—(Communication from Edouard Gouin, Marseilles.)

1166. Andrew Robertson, Neilston, Renfrewshire—Improvements in preventing smoke.

1167. Thomas H. Morrell, Leyland and Littlewood, and Henry Charnley, Preston, Lancashire—An improved machine for making bricks and tiles and other articles from plastic materials

1168. Thomas Wilson, Birmingham, Warwickshire—Improvements in projectiles and cartridges for fire-arms and ordnance.

1169. William E. Newton, Chancery Lane — Improvements in electric conductors for telegraphic purposes, and in the apparatus for and mode or means of transmitting signals between distant places.—(Communication from Benjamin H. Wright, Rome, U. S.)

1170. Joseph Owen, Sheffield, Yorkshire, and George Veitch, Birmingham, Warwickshire—Improvements in the construction of the bottoms of bedsteads, mattresses, couches, sofas, seats, chairs, and other articles for sitting or reclining upon, in order to render them more springy or elastic.

1171. William Clark, Chancery Lane—Improvements in the manufacture of cyanides of barium and strontium —(Communication from Messrs. Louis J. F. Margueritte, and Alfred L. de Sourdeval, Paris.)

1172. William Brown and Charles N. May, Devizes, Wiltshire—Improvements in brick making machines.

1173. Thomas Nasmyth, Rue de l'Etoile, Brussels, Belgium—Improvements in taps and valves.—(Communication from Charles Bacqueville, Quai de la Haute Deule, Lille, France.)

Recorded May 12.

1174. Charles Stevens, Welbeck Street, Cavendish Square—An improved machine for raising water.—(Communication from Jean B. Guignes, Marseilles.)

1175. William Basford, Burslem, Staffordshire — Improvements in the mode of constructing brick walls, and in the mode of forming and ornamenting the materials to be used for the same.

1176. Robert Young, Glasgow—Improvements for apparatus for cleaning grain.

1177. William Senior and William Statter—Improvements in purifying gas, and thereby obtaining a useful product.

1178. John Chatterton, Highbury Terrace, Willoughby Smith, Pownall Road, Dalston—Improvements in electric telegraph conductors

1179. Silas C. Salisbury, Essex Street, Strand, Westminster—An improved construction of metallic fencing.—(Communication from M. A. Myers, New York, U. S.)

Recorded May 14.

1181. Henry L. Lilley, Stand Lane, Lancashire—Improvements in machinery or apparatus for scraping starch.

1182. Edward Lord, Todmorden, York—Certain improvements in machinery for opening, blowing, and cleaning cotton and other fibrous materials.

1183. William H. Muntz and Henry King, Millbrook, Hants—Certain improvements in marine steam engines, part of which is applicable also to ships' pumps.

1184. William E. Newton, Chancery Lane—An improvement in iron pavements.—(Communication from Baron Otto des Granges, St. Louis, Missouri. U. S.)

1185. William E. Newton, Chancery Lane—Improvements in the construction of metallic barometers.—(Communication from Felix Richard, Paris.)

1186. Thomas Howarth, Preston, Lancashire—Improvements in machinery or apparatus applicable to looms for weaving, and the tools employed therein.

1187. Edward T. Jones, Ashburnham Grove, Greenwich, Kent, and Henry Owen, Llantrisant Rectory, North Wales—Improvements in roasting jacks.

Recorded May 15.

1188. Robert Reid, Havelock Street, Leceister—Improvements in the process of waterproofing fabrics for garments so as to allow perspiration to pass through the same

1189. Charles Stevens, Welbeck Street, Cavendish Square—An improved centrifugal turbine.—(Communication from Jacques D. Bailly, Bourges, France.)

1190. Alphonse Sax, Paris—A new mode of obtaining motive power by the effect of weights and springs, or by springs only, in combination with proper connecting parts.

1191. Bernard Samuelson, Banbury, Oxon — Improvements in reaping and mowing machines.

1192. Samuel Smithard, Nottingham, Henry Wheatcroft, Fore Street—Improvements in the construction of machines for uniting portions of lace, blond-edging, net, and other fabrics, usually called "running on machines."

1193. George H. Barth, Piccadilly, St. James—Improvements in processes for aerating or super-saturating water and other fluids with oxygen, or compounds of oxygen or other gas or gases.

1194. Bartlett Hooper, King William Street, London Bridge—Improvements in the manufacture of a paper suitable for preventing forgery.

1195. James Higgins, Thomas S. Whitworth, Salford, Lancashire—Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous materials.

1196. William E. Newton, Chancery Lane—Improvements in valves and valve gear, for the induction and eduction of steam to and from the cylinders of steam engines, part of which is applicable to other purposes.—(Communication from Addison Crosby, Simeon Savage, and Herman S Stearns, Fredonia, New York, U. S.)

1197. Silas C. Salisbury, Essex Street, Westminster—An improved mode of and apparatus for churning butter.—(Communication from George, W. Mears, New York, U S.)

1198. Julien Denis, Queenhithe—Improvements in the preparation of vegetable matters as a pulp, for the manufacture of paper.—(Communication from Mr. H. Bouchet, Quai Montebello, Paris.)

1199. Stephen N. Larkins, Dover, Kent—Improved bathing apparatus.

1200. Reuben J. Jordan, Berner's Street, Oxford Street—Improvements in pills.

Recorded May 16.

1202. Cortland H. Simpson, Bexhill, Sussex—Improvements in propelling vessels through the water, and apparatus connected therewith.

1203. John Grant, Glen Grant, Moray—Improvements in breakwaters.

1204. Peter Chrimes, Collyhurst Road, Manchester, Lancashire—Improvements in stoppering bottles, jars, and other like vessels.

1205. Joseph Ambler, Little Horton, Bradford, York—A new kind of cloth or woven fabric.

1206. Charles Cowper, Southampton Buildings, Chancery Lane—The manufacture and application to fibres and fabrics of a new blue colour, and compounds of the same with other colours.—(Commnication from Cyprien M. T. du Motay, Paris.)

1207. Alfred V. Newton, Chancery Lane—An improved mode of treating oils, for the production of gas and volatile oils.—(Communication from Societe Parisienne pour l'eclairage au Gaz, Paris.)

1208. William E. Newton, Chancery Lane—Improvements in locks for safes, doors, and other purposes.—(Communication from Lyman Derby, New York.)

1209. Claude M. Guillemin, Rue Madame, Paris—Improvements in submarine electric telegraphs.

Recorded May 17.

1210. William Krutzsch, Chamber Street, Goodman's Field—Improvements in mortars.

1211. Caspar Lowenstein, Crutched Friars—Improvements in arrangements for paying out submarine cables.

1212. Marc A. F. Mennons, Rue de l'Echiquier, Paris—An improved handle or holdfast for files, chisels, and similar tools.—(Communication from Mr. Amedee Paillard, St. Croix, near Geneva, Switzerland.)

1213. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Improvements in the cylinders and pistons of steam and other engines, or machines propelled by aeriform fluids.—(Communication from Joseph A. Mounier, and Georges Brunier, Marseilles.)

1215. Marc A. F. Mennons, Rue de l'Echiquier, Paris—An improved railway brake.—(Communication from Oscar Prevoste, Ham, France.)

1216. Joseph Nicholson, Chaple House, Hensingham, Whitehaven, Cumberland—Improvements in reaping machines.

1217. George Davies, Serle Street, Lincoln's Inn, and St. Enoch Square, Glasgow—A system of chromato-topo-chronographic charts intended to facilitate the study of universal history and chronology.—(Communication from Charles R. Valet, Wangen, Switzerland.)

1218. Andrew Robertson, Neilston, Renfrewshire, and Alexander Ritchie, Glasgow—Improvements in steam boiler and other furnaces, and in the prevention of smoke.

1219. Silas C. Salisbury, Essex Street, Westminster—Improvements in machinery and apparatus to be employed in weaving.

1220. James Cole, Coventry, Warwickshire—Improvements in looms for weaving.

1221. Alfred B. Ibbotson, Sheffield, York—Improvements in vices, part of which improvements is applicable to screw wrenches, spanners, turning lathes, and other tools and machines.—(Communication from Hiram Powers, Florence)

1222. Richard A. Brooman, Fleet Street—An improved mowing machine.—(Communication from Arthur Legros, Tournan, France.)

1223. Samuel Houldsworth, John Henderson, William Henderson, and Thomas Bagley, Durham—Improvements in looms for weaving.

1224. Hezekiah Conant, Willimantic, Windham, Connecticut, U. S.—A new and useful improvement in mechanism for regulating the delivery or letting off of warp in looms for knitting or weaving.

1225. John D. Dunnicliffe, and Stephen Bates, Nottingham—Improvements in bobbin net, or twist lace machines.

1226. William Geeves, New Wharf Road, Battle Bridge, Middlesex—Improvements in saw mills.

1227. Nathaniel Clayton, and Joseph Shuttleworth, Lincoln—Improvements in portable and traction engines.

Recorded May 19.

1228. Hilary N. Nissen, Mark Lane—Improvements in the preparation of paper, in order to prevent the extraction or alteration of writings thereon without detection.

1229. Samuel Fielden, and Abraham Fielden, Todmorden, Lancashire—Improvements in self-acting mules for spinning.

1230. James Ferguson, Paisley, Renfrewshire — Improvements in and connected with looms for weaving.

1231. Charles Stevens, Welbeck Street, Cavendish Square—Improvements in striking clocks.—(Communication from Cure Valla, Paris.)

1232. Alfred R. Turner, Malden, Massachusetts—Certain new and useful improvements in pen holders.

1233. William Ambler, Keighly, York—Improvements in means or apparatus to facilitate the consumption of smoke in furnaces.

1234. Samuel Davey, 32 Hatton Garden — Improvements in fastenings for attaching buttons, studs, brooches, or other ornaments and fastenings, to articles of dress, and for other uses.

1235. Josiah Lees, Birmingham, Warwick—Improvements in the manufacture of swivels, hooks, and rings for attaching and securing watches, chains, or jewellery, parts of which improvements are applicable to key-rings, ear-rings, and other similar articles.

1236. Alfred V. Newton, Chancery Lane—An improved liquid preparation of tobacco.—(Communication from George Jaques, Somerville, Middlesex, Massachusetts, U. S.)

1237. William E. Newton, Chancery Lane—Improvements in looms for weaving carpets and other looped and pile fabrics.—(Communication from Charles Crossely, New York, U. S.)
1238. William E. Newton, Chancery Lane—Improvements in printing blocks for printing fibrous and textile fabrics.—(Communication from Thomas Crossley, New York.)
1239. John Longmaid, Galway, Ireland—Improvements in treating iron pyrites and other ores containing copper, silver, and tin, or either of them, and sulphur.
1240. Christopher Binks, Parliament Street, Westminster, and John Macqueen, Old Jewry—Improvements in treating certain manganese compounds for obtaining oxides of manganese and other products therefrom.

Recorded May 21.

1241. Charles J. de Meyer, Brussels, Belgium—Improvements in piano-fortes.
1243. Thomas Blakeley, Liverpool, Lancashire—Improvements in rotatory engines.
1245. Thomas W. Tenlon, Enston Road—Improvements in chimney tops.
1246. William Barker, the younger, Huyton Brewery, near Liverpool, Lancashire—Improved apparatus for regulating the temperature of ale, beer, porter, and other liquids during the process of fermentation.
1247. James Craig, Paisley, Renfrewshire—Improvements in cropping and clipping machines, for the treatment of woven fabrics.
1248. Samuel R. Samuels, Nottingham—Improvements in machinery used in weaving.
1249. George Nimmo, Glasgow—Improvements in the manufacture of iron.
1250. Valantine Baker, Hounslow—Improvements in breech-loading and other ordnance.
1251. William E. Newton, Chancery Lane—Improvements in the mode of, and apparatus for winding clocks or other time-keepers.—(Communication from C. B. Hoard, U. S.)
1252. Alfred Holland, Queen Street, Oxford Street—An improvement in the construction of roller blinds.

Recorded May 22.

1253. George Moulton, Manchester, Lancashire—Improvements in machinery for transferring to or tracing upon printing rollers or cylinders copies of designs or patterns intended to be etched or engraved thereon.
1254. Joseph W. Wilson, Buckingham Street, Strand, and John Harris, Gresham Street—A new method of constructing and forming boxes or cases, for containing and enclosing different articles, more especially during their transmission by post or other conveyance.
1255. John Green, Newton, St. Martin, Worcester—Improvements in the construction of ploughs, cultivators, and similar agricultural implements.
1256. Samuel Hood, Upper Thames Street—The manufacture of improved wrought-iron sash-frames and casements, and all kinds of wrought-iron framing.
1257. James Hinks, Birmingham, Warwick—Improvements in lamps for burning petroline and other liquid hydro-carbons, and in supports for the said lamps.
1258. Bewicke Blackburn, Clapham Common, Surrey, and Henry Carr, Victoria Street, Westminster—Improvements in railway axle-boxes and axles.
1259. John Marland, Southport, Lancashire—Improvements in preparing for and in warping and sizing woollen and worsted and other yarns and threads.
1260. William T. Shaw, Bunhill Row—Improvements in thaumatropes or phenakistoscopes.
1261. John Bottomley, Laister Dyke, Bradford, York—Improvements in means or apparatus employed in spinning wool and other fibrous substances.
1262. James Hickisson, Maria Street, Kingsland Road—Improvements in means or apparatus for ascertaining the character of metals, particularly applicable to the detection of counterfeit coin.
1263. James Goldie, Glasgow—Improvements in furnaces and in the consumption or prevention of smoke.
1264. John Paton, Glasgow—Improvements in machinery or apparatus for winding, lifting, and boring for mining purposes.
1265. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in machinery or apparatus employed in spinning.—(Communication from Edmund Victory, Watertown, Jefferson County, New York, U. S.)
1266. William Clissold, Dudbridge, Gloucestershire—An improvement in the manufacture of driving belts.
1267. William Clissold, Dudbridge, Gloucester—An improvement in the construction of gearing wheels.
1268. Michael Henry, Fleet Street—An improved mode of suspending gas lights.—(Communication from Jean C. C. Gallibour, Boulevard St. Martin, Paris.)

Recorded May 23.

1269. George Paul, Glasgow—Improvements in machinery for winding yarn or thread.
1270. Thomas Cope, Liverpool, Lancashire—Improvements in the treatment and preparation of tobacco.
1271. William H. Burnett, Margaret Street—Improvements in electric telegraphs, and in apparatuses employed therewith, a part of which improvements is applicable to the winding of clockwork.
1272. Michael Cavanagh, Kensington—Improvements in lock spindles.
1273. Pierre E. Chevalier, Boulevart St. Martin, Paris—An improved table-stand for the support of glasses and other articles.
1274. George Bartholomew, Linlithgow, North Britain—Improvements in shoes for the feet of horses and other animals.
1275. Robert H. Collyer, Alpha Road, Regent's Park—Improvements in the manufacture of tubes and other vessels and other articles, and in the machinery and apparatus connected therewith.
1276. Charles F. Atkinson, Sheffield, Yorkshire—Certain improvements in the manufacture of chains.
1277. John Summerscales and Jubal Sagar, Keighley, Yorkshire—Improvements in washing, wringing, mangling, squeezing, and crushing machines.
1278. Thomas Heppleston, Manchester—An improvement or improvements in breech-loading fire-arms, and in projectiles to be used therewith.
1279. William Howard, Great Russell Street—An improved window blind.
1280. Denis Mulkay, Rue Rasiere, Brussels—Improvements in springs for supporting or distending ladies' dresses.
1281. William H. Barker, Kingston-upon-Hull—Improvements in moulds for candles.
1282. François J. E. D. de Bonssois, Place Vendome, Paris—Improvements in the manufacture of tubes, hollow axles, shafts, gun-barrels, masts, and other tubular metal articles.
1283. François J. E. D. de Bonssois, Place Vendome, Paris—Improvements in the treatment of bituminous rocks, for the extraction of bitumen therefrom, and in the application of the residuum to various useful purposes.

Recorded May 24.

1284. John Sharp, Bradford, Yorkshire—Improvements in looms for weaving.
1285. Richard H. Heighway, Strand—An improved cooking apparatus.
1286. Thomas Johnson, Plumstead, Kent—Improvements in machines for washing bottles and jars.
1287. Robert C. Clapham, Walker, Northumberland, and Richard Cail, Gateshead, Durham—Improved deodorising agents.
1288. William Baker, Sheffield, Yorkshire—Improvements in the manufacture or production of white lead.
1289. William E. Newton, Chancery Lane—Improved machinery or apparatus for mixing and moulding materials for the manufacture of fuel, part of which machinery or apparatus is applicable to moulding bricks and other analogous articles.—(Communication from Messrs. Couillard and Mazeline, Havre, France.)
1290. John Paddon, Swansea, and William Lowther, Briton Ferry, near Neath, South Wales—Improvements in coke ovens.—(Communication from Henry Eaton, Nantes and Bordeaux, France.)
1291. Frederic W. Prince, Wellington Street, London Bridge, Surrey—Improvements in fire-arms and ordnance.

Recorded May 25.

1292. Ermelinde de B. Stevens, Antwerp, Belgium—Improvements in ladies' stays.
1293. Charles D. Waddell, Queen's Terrace, Bayswater—Improvements in ordnance and fire-arms, and in the application and arrangement of the propelling agents with which they are charged.
1294. John Ingham and George Collier, Halifax, Yorkshire—Improvements in the manufacture of fabric, of the character of that technically called "camlet."
1295. John Macintosh, North Bank, Regent's Park—Improvements in breech-loading fire-arms, ordnance, cartridges, and projectiles.
1297. Benjamin Finch, Beaufort Square, Chepstow—An improvement in the arrangement of the rudders of ships and vessels.
1298. Thomas Dickins, Middleton, and Gilbert M'Culloch, Manchester, Lancashire—Improvements in machinery or apparatus for spinning and doubling silk, cotton, and other fibrous materials.
1299. George Wallis, Victoria Grove, Fulham Road, West Brompton—New or improved methods of preparing drawings, writings, designs, prints, or impressions of engravings and photographs, for the purpose of impressing or engraving the same in or upon metallic substances, and thereby producing printing or embossing surfaces or ornamental metallic surfaces for such purposes as the same are or may be applicable to, also new or improved machinery to be employed in the said impressing or engraving.

Recorded May 26.

1300. Georges de Laire and Charles Girard, Imperial Mint, Paris—A new process for manufacturing red and violet colouring matter.
1301. Edward T. Hughes, Chancery Lane—Improved methods of obtaining artificial light, and in the apparatus and burners connected therewith.—(Communication from Gustave A. Kuhne, Berlin, Prussia.)
1302. John Moule, Seabright Place, Hackney Road—An improved apparatus applicable to flushing purposes.
1303. George Elliot, Hall, Houghton-le-Spring, Fence Houses, Durham—Improvements in weighing coal at the screen, and in the apparatus for the same.
1304. Gilbert D. Jones, Pentonville—Improvements in the manufacture of sand, emery, and glass papers and cloths, and in the machinery employed therein.
1305. Richard A. Brooman, Fleet Street—Treating certain animal substances in order to obtain albuminous, gummy, glutinous, and glairy products and fat.—(Communication from Benjamin P. Javal, Paris.)
1306. George Dowler and George J. Farmer, Birmingham, Warwickshire—Improvements in machinery for the manufacture of boot heels and tips, coins, medals, tokens, checks, and such like articles.
1307. John Dale and Henrich Caro, Manchester, Lancashire—Improvements in obtaining colouring matters for dyeing and printing.

Recorded May 28.

1308. Samuel Chatwood, South John Street, Liverpool, Lancashire—Improvements in iron safes, and in locks for the same, which locks are also applicable to other purposes.
1309. George Robinson, Newcastle-upon-Tyne—Improvements in the manufacture of salts and preparations of ammonia.
1310. Joseph J. Welch, Cheapside—Improvements in collars for gentlemen's, ladies', or children's wear.
1311. William J. Murphy, Cork, Ireland—An improved motive power engine.
1312. Thomas Coltman, Gas Street, Leicester—Improvements in the manufacture of reels for reeling cotton and other thread.
1313. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in ruffles or gathered fabrics, and in the apparatus employed in their manufacture.—(Communication from George B. Arnold and Alfred Arnold, New York, U. S.)
1314. William Tasker, the younger, Waterloo Iron Works, near Andover, Hants—Improvements in straw-shakers for threshing machines.
1315. Henry Ditchfield, Calceth, near Manchester, Lancashire—Improvements in machinery or apparatus for folding woven fabrics.
1316. Rev. Henry Moule, Fordington, Dorsetshire, and James Bannehr, Exeter—Improvements in the nature and construction of closets and commodes for the reception and removal of excrementitious and other offensive matter, and in the manufacture of manure from thence.

Recorded May 29.

1317. Christian Schiele, Bebbington, Cheshire—Improvements in the manufacture of lubricants.—(Communication from Ferdinand W. Kleist, Berlin, Prussia.)
1318. Eugene Dufosse, Place Valenciennes, Paris—A system of skeleton or framework with continuous free air currents, applicable to the construction and improvement of seats of any description, matresses, saddles, and upholstery generally, with a view to render them hygienic.
1319. Charles Berck, Herve, Belgium—Improvements in the manufacture of the selvages of woollen cloths and other stuffs.
1320. Thomas Gullick, Pall Mall—An improved spur box.
1321. John Dugdale, jun., and Edward Dugdale, Blackburn, Lancashire—Improvements in the construction of journals and bearings for shafts, spindles, and other similar articles.
1322. Wright Jones, Pendleton, near Manchester, Lancashire—Improvements in machinery or apparatus for doubling or cutting woven fabrics, paper, and other similar materials.
1323. William S. Nosworthy, Coleman Street—Improvements in piano-fortes.
1324. Floride Heindryckx, Brussels—Improvements in the construction of railway chairs.
1325. Alexander Samuelson, Scott Street Foundry, Hull—Improvements in gunboats.
1326. John Trayes, Belfast, Antrim, Ireland—Improvements in steam boilers, or steam and heat generators, and in the application of heat.

1327. Hesketh Hughes, Homerton—Improvements in machinery for goffering, fluting, shaping, embossing, and connecting together, lace, ribbons, and other like materials, parts of which improvements are also applicable to the shaping and corrugating of metals.
1328. Alexander J. Paterson, Edinburgh—Improvements in agricultural traction engines and implements.
1329. Robert H. Collyer, Alpha Road, Regent's Park—Improvements in telegraphic cables, also applicable to other similar purposes.

Recorded May 30.

1331. Edmond A. L. d'Argy, Boulevart St. Martin, Paris—An improved candlestick.
1332. Francis B. Cox, Birmingham, Warwickshire—Improvements in messuring rules.
1333. William Pickston, Radcliffe, and William Bacon, Southport, Lancashire—Improvements in machinery for dyeing, washing, and sizing.
1334. Charles Greenway, Albert Place, Cheltenham—Improvements in the manufacture of salt, and in apparatus used therein.
1335. Eugene Carless, Bow Common—Improvements in the manufacture of all kinds of candles, for the purpose of rendering them free from guttering.
1336. William E. Newton, Chancery Lane—Certain improvements in machinery for preparing and spinning hemp and similar fibrous materials.—(Communication from Joseph C. Todd and Philip Rafferty, Paterson, Passaic, New Jersey, U. S.)

Recorded May 31.

1337. William R. Bowditch, Wakefield, Yorkshire—Improvements in the purification of coal gas, and of coal oils.
1338. Lavington E. Fletcher, Upper Norway, Surrey—Improvements in steam engines and boilers and their appurtenances.
1339. Samuel Rowbotham, Putney, Surrey—Improvements in the composition and manufacture of soap.
1340. Alfred V. Newton, Chancery Lane—Improvements in the application of steam to the warming of buildings and apartments, and in apparatus therefor.—(Communication from Lewis W. Leeds and Calvart Vaux, New York, U. S.)
1341. Charles Aldin, Clapham Park, Surrey—An improvement in the construction of paving-tiles.
1342. William Farrell, St. Helens, Lancashire—Improvements in apparatus used in hoisting and lowering, as applied to mine shafts.
1343. James A. Manning, Inner Temple—Improvements in the treatment, application, and use of sewerage matters, and the general wastes of towns and factories.
1344. John Kinniburgh, Shotts Iron Works, Lanarkshire—Improvements in the manufacture or production of metal pipes and other generally similar tubular articles.
1345. George Mackenzie, Paisley, Renfrewshire, and John Hamilton, Glasgow—Improvements in bobbins or holders for textile materials.
1346. Joseph Menday, Quarry House, Frindsbury, Rochester, Kent—Improvements in kilns employed in and for the manufacture of cement.
1347. William H. Harfield, Royal Exchange Buildings—Improvements in capstans and windlasses, and in shackling-chains.
1348. Charles Clay, Walton Grange, Wakefield, Yorkshire—Improvements in implements for scarifying and grubbing or cutting up weeds, and otherwise cultivating land.

Recorded June 1.

1349. Richard Threlfall, Bolton, Lancashire—Improvements in the spinning machinery commonly called self-acting mules.
1350. Thomas Cresswell and Henry Lister, Huddersfield, Yorkshire—Improvements in or applicable to fabrics composed of wool, cotton, silk, or other fibrous substances.
1351. George Parsons, Martock, Somersetshire—Improvements in the manufacture of carts, waggons, and drays.
1352. Thomas Greenwood and John Batley, Leeds, Yorkshire—Improved machinery for cutting and shaping wood.
1353. William E. Newton, Chancery Lane—A new and improved regulator for gas burners.—(Communication from George W. Crummey, New York, U. S.)
1354. Andrew G. Hunter, Dean Street, Newcastle-upon-Tyne—Improvements in the manufacture of chlorine.

Recorded June 2.

1356. William Stratford, Mile-End, Old Town—Improvements in fire bars.
1357. Charles W. Lancaster, New Bond Street, James Brown and John Hughes, Newport, Monmouthshire—Improvements in cannon and other ordnance.
1358. James Austin, Mill Isle Mills, Donaghadee, Down, Ireland—Improvements in traction engines in connection with machinery or apparatus for ploughing or cultivating land.
1359. George Horner, Falls Road, Belfast, Antrim—Improvements in hackling flax and other fibrous materials, and in machinery for the same.
1360. William E. Newton, Chancery Lane—An improved permutation lock.—(Communication from William A. Carpenter, Elgin, Illinois, U. S.)
1361. William E. Newton, Chancery Lane—Improved machinery for kneading or preparing clay for the manufacture of bricks or other articles made from plastic materials.—(Communication from Claus H. Clausen, Broager, Denmark.)
1362. William W. H. Smith, Birmingham, Warwickshire—Improvements in the mode of and apparatus for preparing leather for harness and boot and shoe manufacturers.

Recorded June 4.

1363. Isaac James, Tivoli Works, Cheltenham, Gloucestershire—Improvements in washing, wringing, and mangling machines.
1365. John Juckes, Newgate Street—Improvements in pipes for smoking tobacco.
1367. William E. Gedge, Wellington Street, Strand—Improved machinery or apparatus for manuring land.—(Communication from Jean E. Pillier, Lieusaint, France.)
1369. John Pinches, Oxendon Street, Haymarket—An improved press for embossing and stamping paper, linen, and other fabrics and substances.
1370. Thomas Reid, Monkton Miln, Ayrshire—Improvements in machinery, apparatus, or means for actuating or working railway brakes.

Recorded June 5.

1371. William Taylor, Nursling, near Southampton, Hants—The improved heating of hothouses and other buildings by means of flat pipes made of any malleable material, and for manufacturing thereof.
1373. Charles Senoir, Deadwaters, near Huddersfield, Yorkshire—Apparatus for utilising the heat in the flues of steam and other engines.
1375. François C. Richer, Waterloo Road, Surrey—Improvements in breech-loading fire-arms and in their cartridges.
1376. William Trenter, Clerkenwell Green—Improvements in washing and wringing machines.
1377. Joseph Jardin and Paul A. Girard, Boulevart St. Martin, Paris—A new or improved machinery for manufacturing brick, tiles, and other ceramic products.
1379. Edward Lavender and Robert Lavender, Bromley Street, Commercial Road, Stepney—Improvements in destructive and vinous distillation.
1380. George Bower, St. Neots, Huntingdon—Improvements in apparatus for manufacturing, controlling, and regulating the flow of gas.
1381. Joseph Apsey, Cornwall Road, Lambeth, Surrey, and William G. Buckwell, Phœnix Stone Works, East Greenwich, Kent—Improvements in steam boilers and other furnaces.
1382. George Hadfield, Carlisle, Cumberland—Improvements in the manufacture of casks or barrels, and in the machinery to be used therein.
1383. George and Joseph Jenkins, Young's Buildings, Hare Court, Aldersgate Street—An improved portable arm chair.

Recorded June 6.

1386. Francis H. Wenham, Brixton, Surrey—Improvements in steam engines.
1387. Charles Stevens, Welbeck Street, Cavendish Square—A new material for packing and other purposes, together with the apparatus used in the manufacture thereof.—(Communication from Jean P. B. Masson and Antoine Meillard, Lyons, France.)
1389. Marcel G. Deschamps, Strand—Improvements in machinery for carving and sculpturing.
1390. Joseph Jewisbury, Kinver, Staffordshire—Certain improvements in machinery for the manufacture of screws.
1391. Charles Hadfield and William A. Attkins, Hadfield, Derby—Improvements in machinery for preparing, making, and moulding bricks, tiles, and other articles formed of clay, peat, or other materials.
1392. Peter Hooley and John Wood, Manchester, Lancashire—An improvement in the manufacture of cotton wadding and in machinery or apparatus connected therewith.
1393. John Saunders and Joseph Piper, Cookley Iron Works, Kidderminster—Improvements in the manufacture of tin and terne plates.

Recorded June 7.

1395. James Brown, Ribchester Terrace, Bridge Road, Stratford, Essex—Improvements in fire bars, retorts, and other appliances connected with furnaces, &c.
1397. Pierre Vangenberg, La Chapelle, St. Denis, Paris—An improved loco-mobile steam saw-mill.
1398. James P. Bath, Aigburth, near Liverpool, Lancashire—Improvements applicable to carriage wheels for use on common highways, railroads, or tramways.
1399. Jeffries Kingsley, Great Coram Street—Improvements in testing screw propellers and paddle wheels.
1400. Edwin H. Higginbotham, and Aaron Beech, Macclesfield, Chester—Certain improvements in machinery or apparatus for the prevention of explosions of steam boilers, arising through deficiency of water or over pressure of steam.
1401. Robert Bromwich, Birmingham, Warwick—An improved cock for drawing off or regulating the flow of liquids or fluids.
1402. Edward J. Hughes, Manchester, Lancashire—Certain improvements in machinery or apparatus for roving, spinning, and doubling cotton, wool, flax, and other fibrous materials.—(Communication from William H. Rhodes, and Theodor Rudiger, Chemitz, Saxony.)
1403. William Clark, Chancery Lane—Improvements in electric telegraph apparatus—(Communication from Pier A. Balestrini, Paris.)
1404. William Clark, Chancery Lane—Improvements in the preservation of animal and vegetable matters.—(Communication from Jules R. Lion, Boulevart St. Martin, Paris.)
1405. Eustache M. Sainton, Boulevart St. Martin, Paris—Improvements in knitting processes, and in apparatus for the same.
1406. Moritz Jacoby, James Redgate, Sneinton, and Joseph Stones, Nottingham—Improvements in the manufacture of bobbin net or lace, in bobbin net machines.
1407. George J. Cookson, Dorset Street—Improvements in gas regulators.—(Communication from James Gabriel, Pavyer, St. Louis, U. S.)
1408. George A. Waller, Saint James' Gate, Dublin—Improvements in apparatus for filtering and solidifying.

Recorded June 8.

1409. James Wright, Bridge Street, Blackfriars—An improved apparatus for washing and separating metals or their ores from impurities or other foreign matters which are mixed with them.—(Communication from Messrs. Barre, Raugnon, and Co., Paris.)

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 24th May to 20th June, 1860.

May	24th,	4260	William H. Parker, Birmingham.—"Self-sifting ash pan."
	26th,	4261	Thomas Long, 2 Clarendon Place, Notting Hill, W.—"New and improved paint straining frame."
	—	4262	Wallis and Haslam, North Hants Iron Works, Basingstoke.—"Bit of the head gear of a plough, usually designated the peel or cross-head."
	—	4263	C. and J. Clark, Street, near Glastonbury.—"A child's shoe."
June	9th,	4264	Moore and Co., 90A St. Martin's Lane, W.C.—"A minnow or other fish trap."
	14th,	4265	Francis Takhezy, 31 Berners Street, W.—"Revolving Central Folding Chair."
	20th,	4266	William Woodrow, 3 Princes Street, Hanover Square, W.—"The Fez Burnous."
	—	4267	W. and T. S. Blenkiron, Wood Street, Cheapside, E.C.—"The Spiral Spring Petticoat Cord."

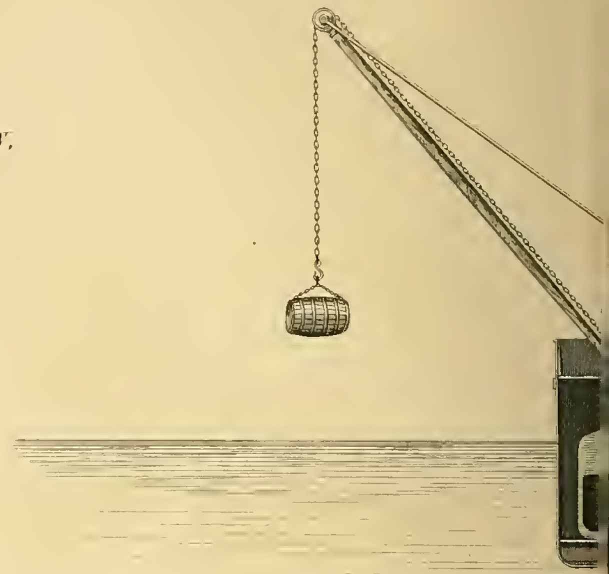
TO READERS AND CORRESPONDENTS.

C. W. W.—The name "Electrum" was applied by the ancients to an alloy of four parts of gold, and one of silver. But electrum mathematical instruments, as now made, are formed out of an alloy of nickel, zinc, and copper, in proportions averaging 27 parts of nickel, 19 of zinc, and 52 of copper. German silver is made of nickel, 25 parts; zinc, 25; and copper, 50.

VAGE STEAM SHIP,

PPIN, *LONDONDERRY* & JOHN WEILD, *GLASGOW*,

PATENTEES.



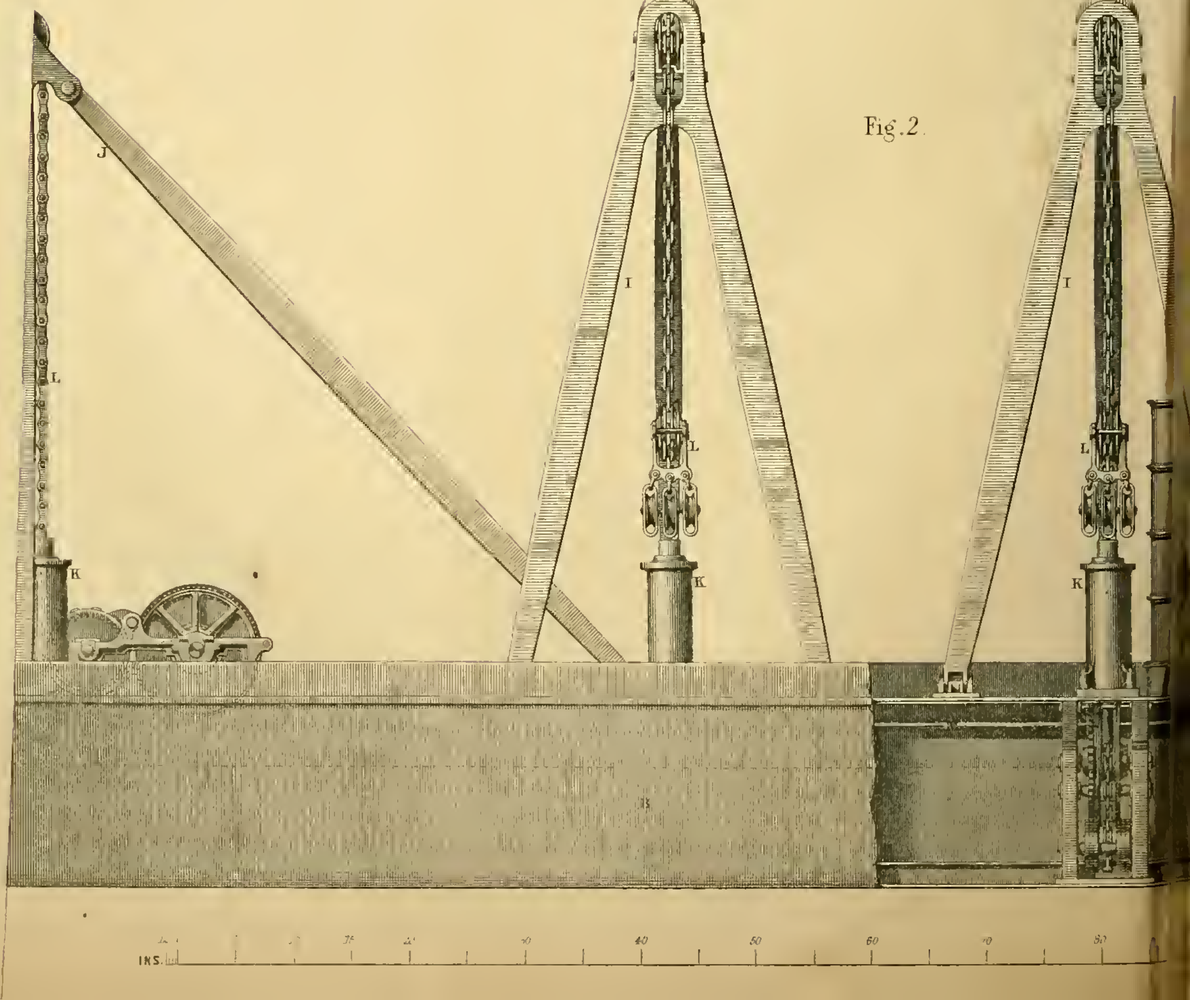
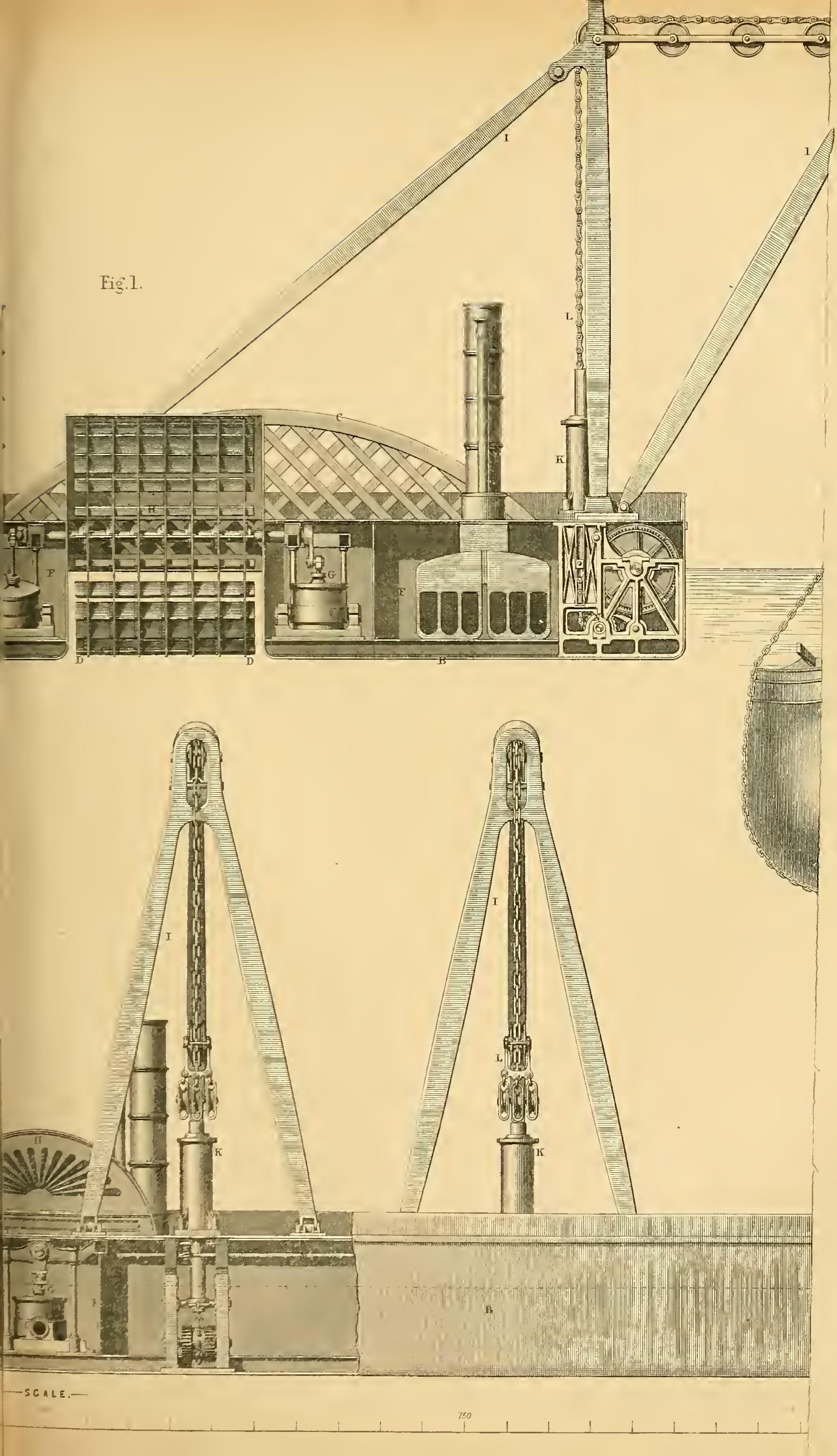


Fig. 2.

Fig. 1.



SALVAGE STEAM SHIP,

CAPTAIN COPPIN, *LONDONDERRY* & JOHN WEILD, *GLASGOW*,

PATENTEES.

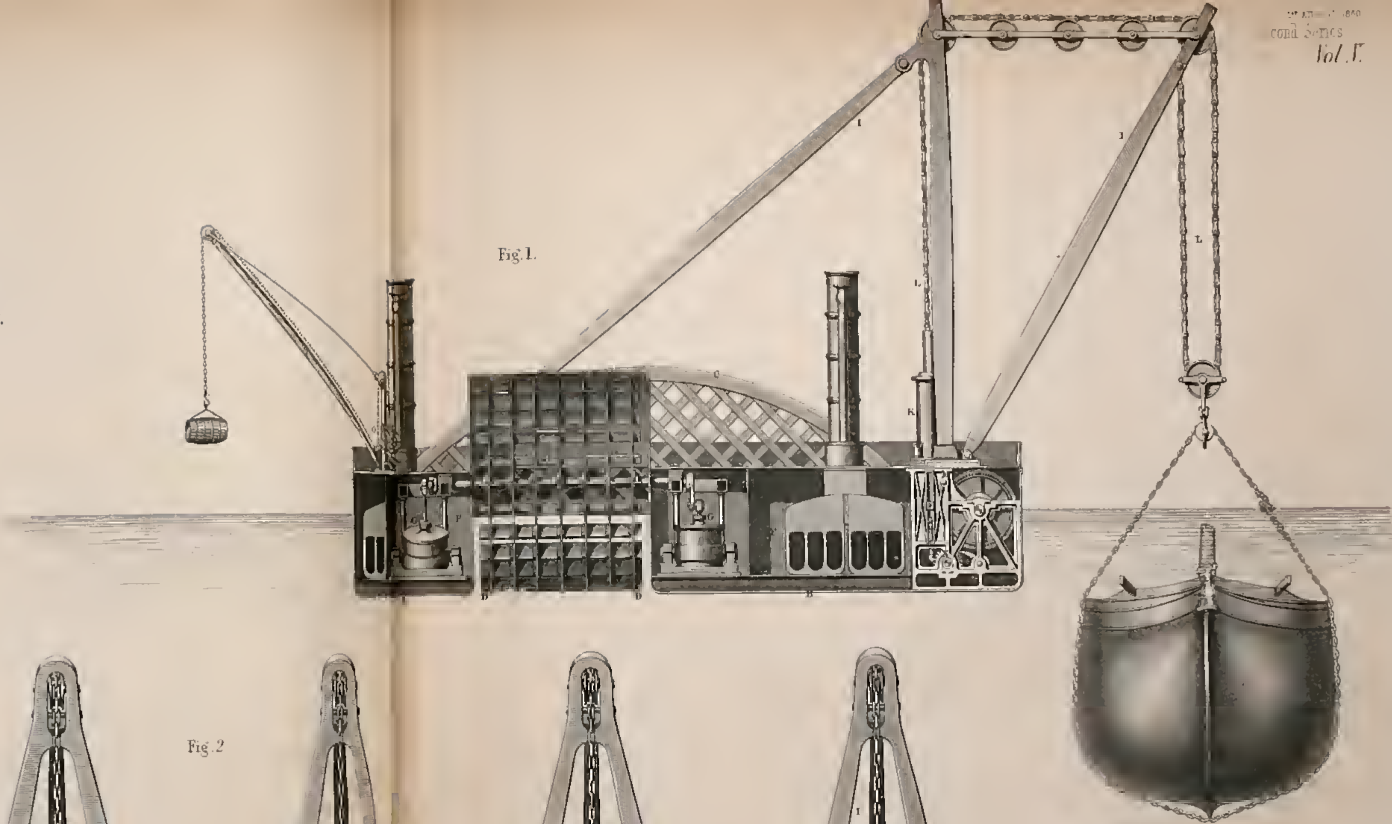


Fig. 1.

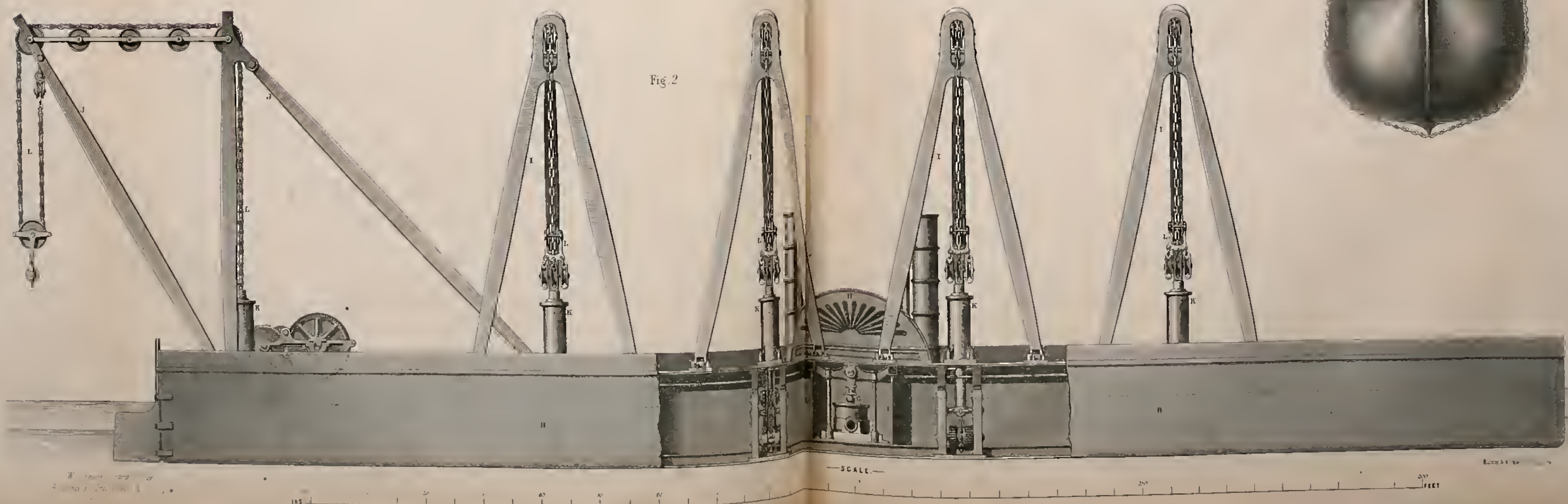
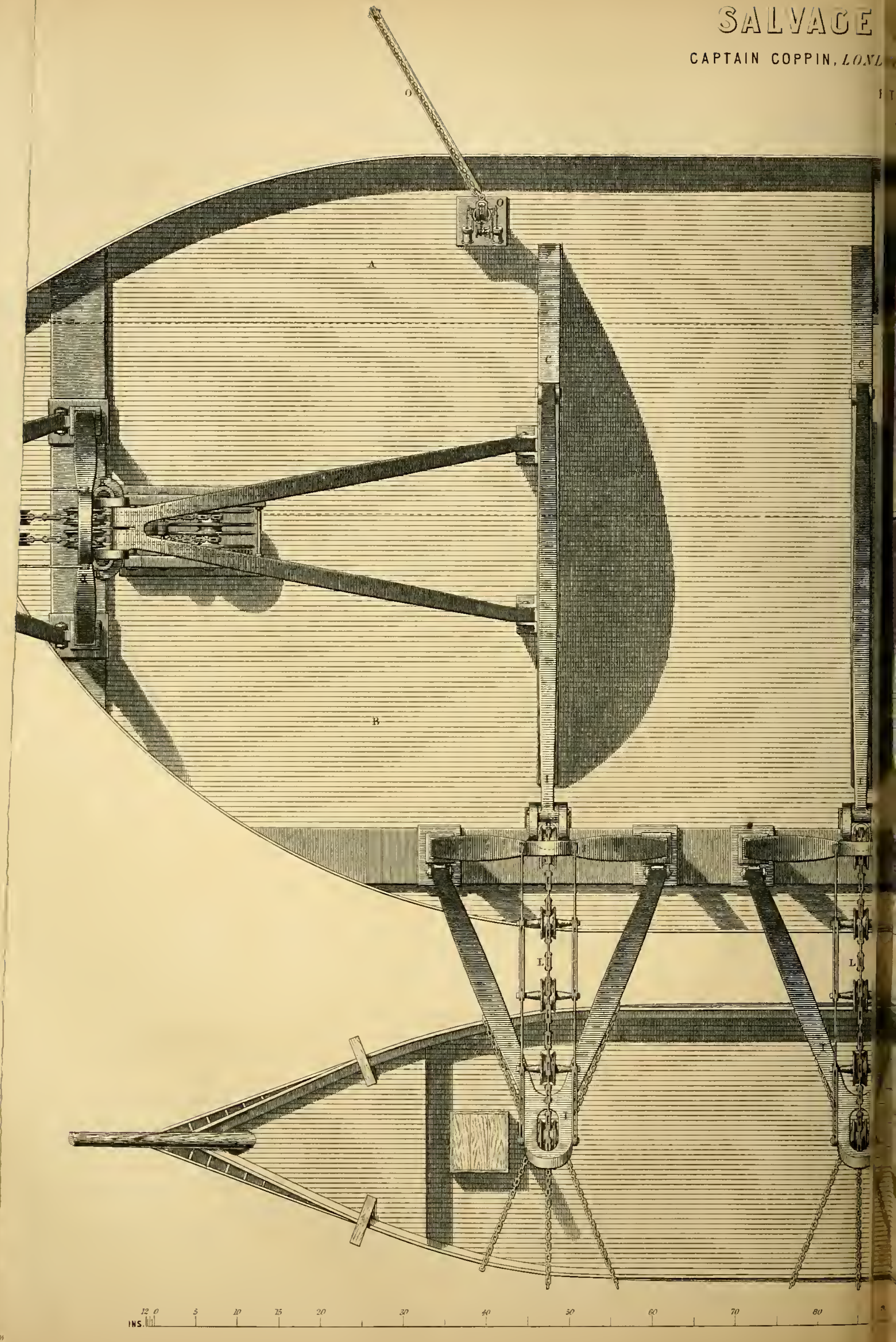


Fig. 2

—SCALE.—

SALVAGE

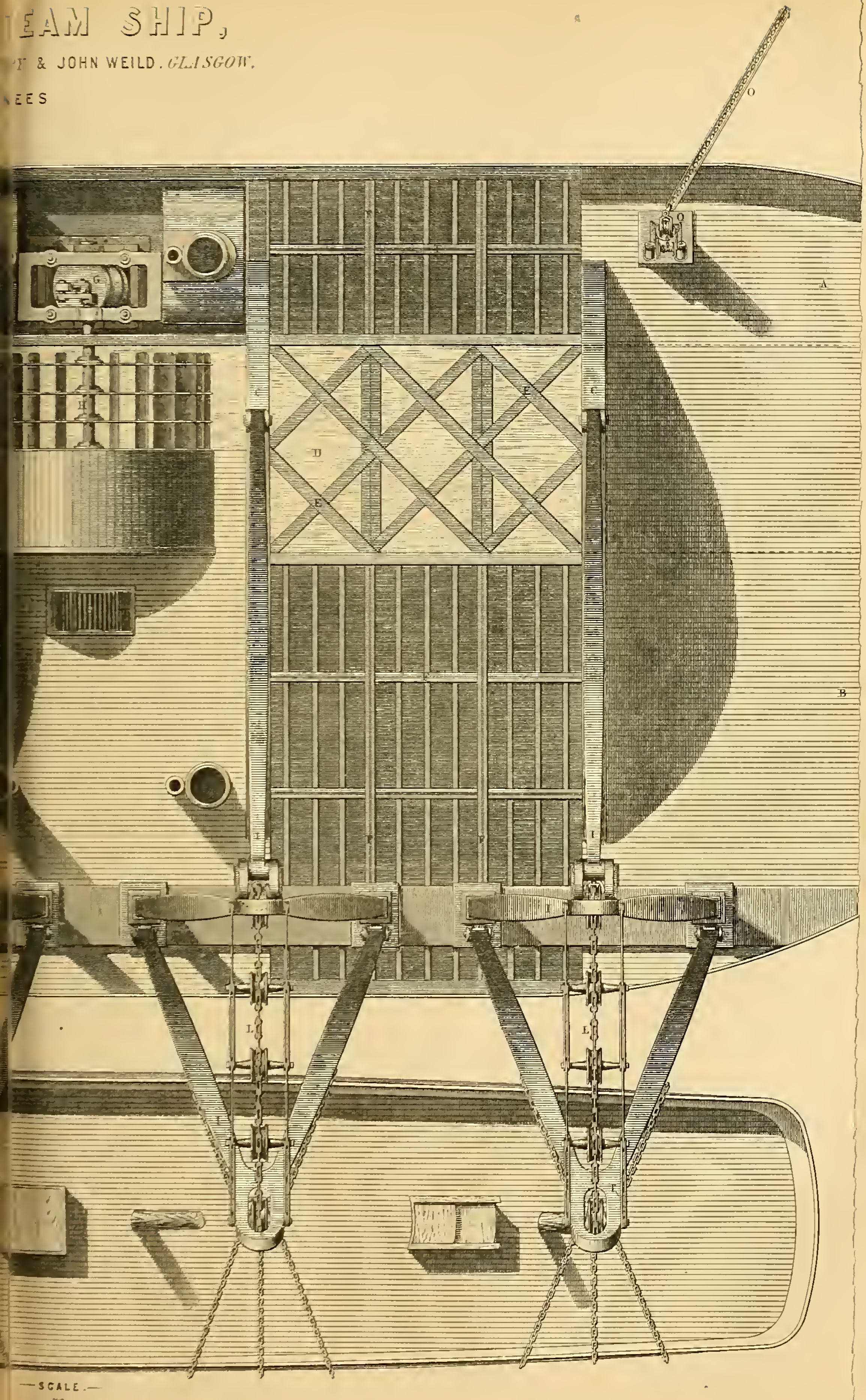
CAPTAIN COPPIN, *LOND*



EAM SHIP,

Y & JOHN WEILD. *GLASGOW.*

EES



—SCALE.—

100

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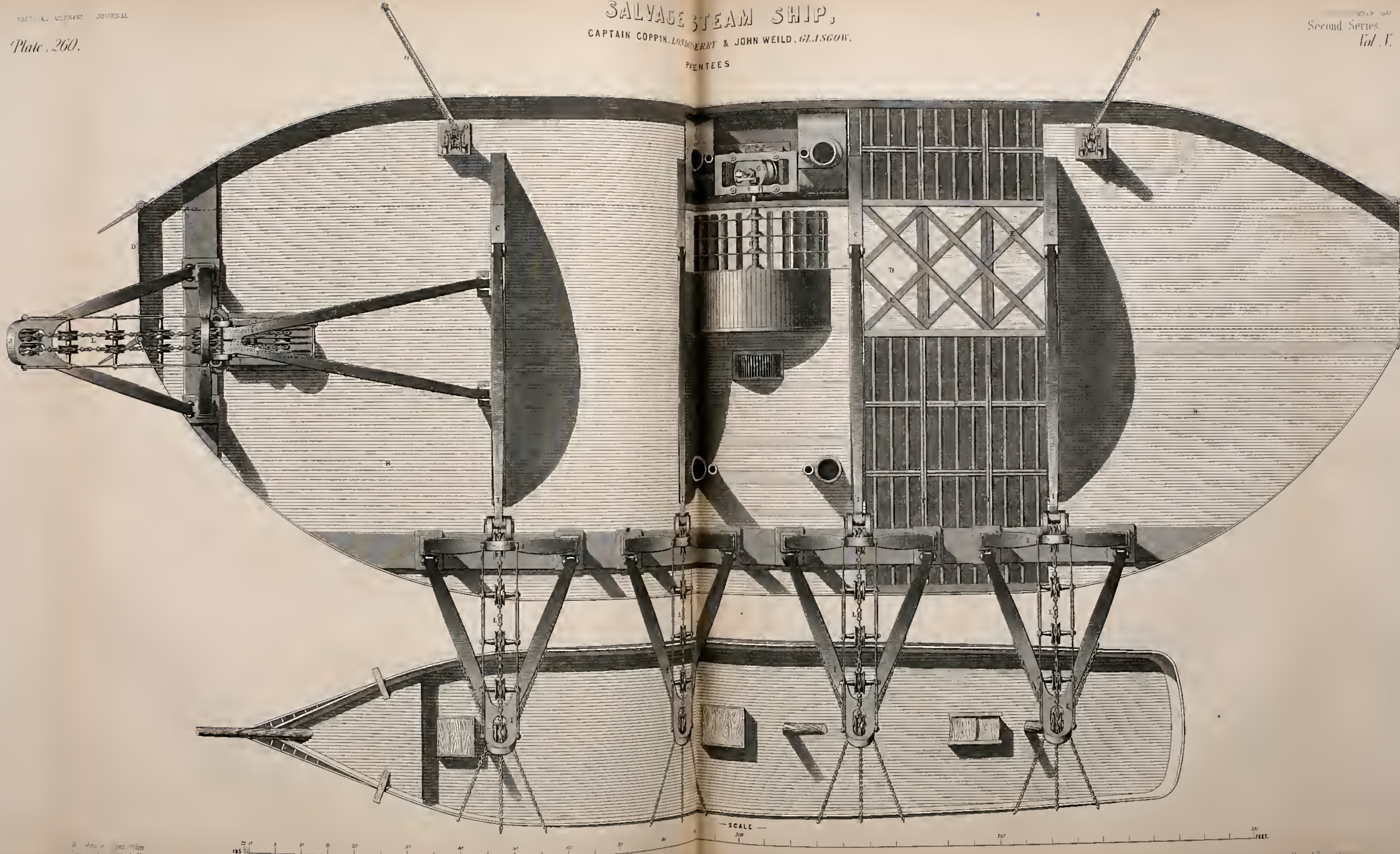
SALVAGE STEAM SHIP,

CAPTAIN COPPIN, LONDONDERRY & JOHN WEILD, GLASGOW,

PATENTEES



SALVAGE STEAM SHIP.

By Captain T. Coppin, *Londonderry, and* John Weild, *Glasgow.*

(*Illustrated by Plates* 259 *and* 260.)

Few persons beyond those immediately interested in the subject, are aware of the extent of the annual loss sustained by ship owners arising from their vessels being wrecked. The number of wrecks on the coast of the United Kingdom during the five years ending 1857, amounted to 5128, being an average of 1025 per year. In the year 1858, the number was 1170, and it appears from the Board of Trade Returns for 1859, that there were 1416 casualties in that year.

Although such an enormous loss as this takes place annually, yet it is well known to all who have been interested in operations for saving wrecked property, that up to the present moment, there is no efficient apparatus in Great Britain available for the recovery of stranded and submerged vessels.

In instances (which are very numerous) where the hull is partially submerged, and when the water inside rises and falls to the outside level, the time consumed in discharging, and the difficulty and cost of saving ship and cargo, is increased to an enormous extent, unless, as in some few instances, where it is possible to stop the leaks and pump the ship out by manual labour or steam power. When it is found impossible to keep the vessel free of water, the most efficient way to float her is to put a platform or false bottom inside at low water mark, making it and the ceiling or inside planking of the ship water tight. Another mode is to place casks or other artificial displacement inside or made fast to the outside of the vessel. There are modifications and sometimes combinations of these plans which need not here be explained, as they all involve a similar principle. It is here only necessary to refer to vessels entirely submerged. In all cases where the cargo is much above the specific gravity of water, it must be discharged by divers, or otherwise, before any means can be taken to raise the vessel. The usual mode of lifting is, to make fast *at low water* a sufficient number of lighters, barges, pontoons, or other means of displacement, and so lift the vessel clear of the ground, and as the tide flows it is carried into a lesser depth of water, and the same process is repeated until as much as possible of the hull is left above low water mark, when one or other of the before described modes is then applied to remove the vessel to a position where it may be repaired. It will be at once apparent, that the lift at each tide will only be the rise of the tide, less the amount of displacement required to float the vessel. The expedient (which is sometimes adopted) of loading the lifting craft, and discharging them after they are made fast is seldom, if ever, found more than sufficient to tighten the chains, so that each one may be brought to bear its due proportion of strain. There is at present no available machinery capable of heaving to the surface of the water a vessel of any size, greater than from 50 to 60 tons.

It will be obvious from the foregoing remarks, that there are really no efficient means in use to save shipwrecked property, and to supply this want an apparatus has been recently patented, under the designation of the Patent Salvage Steam Ship, the patentees of which have for many years been actively engaged in taking charge of, and saving wrecked vessels and their cargoes. The following is a general description of the apparatus:—Fig 1, plate 259, is a transverse section of the Salvage Ship, and fig. 2, is a side elevation, partially in section. The vessel is what is usually termed a "twin" vessel, formed by two hulls, A, B, of unequal size, placed some distance apart and connected together by transverse and vertical "lattice girders," C, which project above and extend over both decks, and the space, D, between the vessels; they are also united by additional horizontal girders and diagonal tie bars, at E, shown best in the plan, plate 260, and the whole is covered with a deck on the same level, making them as rigid as one vessel. Both hulls are divided into a number of water-tight compartments by longitudinal and transverse bulk-heads, F, which greatly increases the strength and safety of the vessel. The propelling power is produced by a pair of oscillating engines, G, connected directly to the shaft of a large single paddle wheel, H, placed in the space, D, between the hulls, sufficient to give a speed of from 9 to 10 knots per hour. The lifting machinery consists of four sets of double shears, I, arranged along the side of the larger hull, B, of the vessel. One set, J, is placed at the end of, and resting on both the vessels, A and B; and connected with each set of shears is a large hydraulic ram or press, K, wrought by a powerful steam engine. To these rams, suitable pitch chains and blocks, L, are attached, the pumps of which are connected to the same main pipe from the pumps when lifting, so that the strain comes equally on all the tackles. Pitch chains are much more suitable than the ordinary link chains for this purpose; and being made out of rolled bars without welds, the chance of their breaking is almost entirely obviated. The chains pass down through the hollow ram, and are attached to the cross head below, the slack of the chain being taken up by large drums, arranged for that purpose, and worked by the engine which gives motion to the pinions on the shaft, M, passing along the whole length of the ship. Prior to reaching the drum, the chains, L, pass round the componnd pitch and ratchet wheels, N, which are prevented from moving in a backward direction by means of pawls, so that the chains are securely held, whilst another lift is being taken. In fig. 1, the hull of a ship is represented as in the act of being lifted. It is calculated that after the sling chains are passed round or under the wreck, the lifting will not occupy more than from one to two hours, and can be performed at any state of the tide. While the operation of hoisting the wreck is in progress, a sufficient quantity of water is pumped into the compartments of the smaller vessel, A, to counterbalance the weight lifted by the machinery on the larger one.

Steam cranes are also placed on the smaller vessel, fitted and fixed in such positions, as at O, that the cargo can be lifted out of the hold of the stranded vessel and placed on the deck, or in the hold of the salvage ship. There are a sufficient number of cranes to work all the hatches of the largest ship, and by this means a cargo can be saved in less time than by any other mode, in fact, a medium cargo might be saved before any other effective appliances could be collected and brought to the spot. It is no exaggeration to say, that by these means, a stranded vessel could be discharged in less time than it could be effected alongside a quay in any port of the United Kingdom, by ordinary means.

The salvage steam ship has at each end four windlasses of great power driven by steam, having chains and anchors of corresponding strength and size; which, besides mooring the ship, can be used for the purpose of heaving the stranded vessel off, and are more effective for such a purpose than the united power of a number of the most powerful tugs. There are also powerful steam pumps of unusual size, the suction pipes of which are intended to be carried into the stranded vessel, and by this means it may be kept free when pumps driven by manual labour would be ineffective.

Having described the salvage steam ship and its machinery, it is now necessary to explain how it may be used for the purposes contemplated. It will be evident, from the description of the apparatus, that it may be constructed to lift any reasonable weight independent of the rise and fall of the tide; and that, if the weight of the vessel and cargo does not exceed the lifting power, it may, in a few hours, remove the ship to a place of safety—simply by slinging, and lifting the whole by the hydrostatic machinery. In such cases, the difficulty of slinging may be advanced as an objection; but this is more apparent than real, when it is taken into consideration that, owing to the way in which the lifting shears are placed, and the manner in which the large purchases are fitted, the strain is so divided that each sling chain will not have to lift more than an ordinary chain will bear with safety. To understand this, let it be supposed that the lifting power is 500 tons, that a salvage apparatus of this size has four pairs of shears, each of which would have to lift, say, 125 tons, that each lifting chain is a double purchase, and that the lower purchase blocks have attached to them, with compensating blocks, three sling chains to each side of the wreck—a single part of the lifting chain would require to bear 62½ tons, or 125 tons doubled; the sling chains would, therefore, have to sustain, say, 21 tons each, or 125 tons for the six chains. A pitch chain of twice the strength could easily be made, and without being very large—and it would only require a good chain for slings of $1\frac{1}{2}$ inch diameter to lift double the strain that would be necessary for the slings. As to the mode of slinging when vessels are under water, one end would be lifted, and the chains passed under the bottom; but when only partially submerged, the slings can be passed in a similar manner, or made fast to what is above water by a mode which has already been successfully adopted by the patentees in various instances. In cases where the vessel is driven high on the beach, and keeps so tight that, with sufficient water, she would float, the advantage in using the apparatus will also be very great, as it can be laid alongside, the cargo be discharged by the steam cranes, the hydraulic lift applied, and the vessel at once floated without waiting for spring tides; and especially on parts of the coast where there is little rise and fall of the tide, vessels will be saved that would otherwise be abandoned under the circumstances. The cost of saving by ordinary means, added to the repairs, in almost every instance amount to, or exceed, the value of the ship. The difficulty in floating stranded steamers is much greater than sailing vessels, owing to a large proportion of the hull being taken up by the engine compartments, and which, in the event of the vessel filling with water, cannot be made use of for displacement. Vessels propelled by steam almost invariably strike the ground, going at a greater or less speed, and according to the speed at which they are going, slide up the rocks or beach to such an extent, that when the smallest compartment fills with water, the average rise of the tide is not sufficient to float the ship, even after all the cargo has been discharged, and all the available displacement in the filled compartment has been made use of. As more care is now taken to have the bulkheads forming the compartments water-tight, in a majority of instances it is only one or two compartments which fill at first; and if there were any means of making up for the lost displacement in a short time, the steamer would generally be saved. In all cases where only one or even two compartments fill, the process of saving would be simple, provided the means were quickly available; and a large proportion of steamers and sailing vessels, now totally lost, could be easily saved, if an apparatus fit to lift only from 200 to 300 tons, could be procured in a few days after the accident. It is well known to those who are practically acquainted with these matters, that at present, a great proportion of the total loss arises from the want of a certain amount of available artificial displacement, and the delay consequent on preparing it. This apparatus would at once remove the property beyond danger, and prevent the risk arising from protracted preparations, and, what is also of equal importance, prevent further damage to hull or cargo.

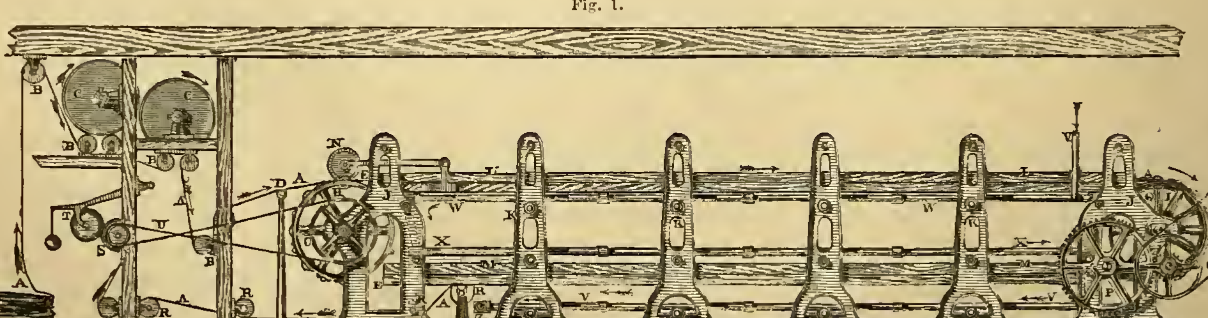
The following facts will give some idea of the large field open to such an enterprise. The average number of casualties on the coast of the United Kingdom, for the six years ending 1858, was 1049 per year; according to the Board of Trade Returns for the same period, there were lost 116 steamers, measuring 37,031 tons, and 3671 sailing vessels of 838,917 aggregate tonnage. This would give an average loss of 19 steam and 616 sailing vessels per year. A competent authority calculates that the average value of this annual loss, will be about £1,772,700. If the *Wreck Chart* for 1857 be examined, it will be found that from the Land's End to Greenock there were 286 wrecks, and that on the Irish coast there were 173 wrecks during that year. In the year ending 1859, there were 565 casualties on the West and Irish coasts, and 28 on the Isle of Man. It is computed that the loss of property during the year 1859 was nearly two millions sterling. There are no statistics by which the amount of property saved from the above casualties can be determined, and there is consequently some difficulty in calculating the probable earnings of the apparatus we have been speaking of; an approximation may, however, be arrived at by taking the actual work that could have been accomplished in a particular district and the cost of recovering the property by the ordinary means. It has been ascertained from perfectly reliable sources, that the number of wrecks in the immediate neighbourhood of the Clyde, from June 1858 to July 1859, was eight steamers and 11 sailing vessels, involving a gross value of £234,000. The amount saved by ordinary means represented an original value of £97,000, the realised value of which was about £57,230, being a depreciation from damage of about 41 per cent. The cost of saving by ordinary means amounted to about £16,240, or about 28 per cent of the saved value. Supposing that the operations had been entirely confined to the district in and near the Clyde, it may safely be calculated that the earnings would have amounted to not less than £20,000 per annum. The apparatus could, however, accomplish a greater amount of work than this, and on the coasts of the Irish Channel would earn a large additional sum. It may also be mentioned that the hulls and machinery of iron ships, already submerged in the district mentioned, and abandoned in consequence of there being no means to recover them, might be recovered, and would give employment, when not engaged at more important work, which would yield a considerable profit. It may be confidently assumed that an apparatus of moderate power would realise a revenue from the sources mentioned, of at least 30,000 per annum, which, after deducting working expenses, would leave a large profit. That the steam salvage ship would command work to this amount is evident from the fact, that it could undertake the work on the condition that the charge should be a per centage on the amount saved, and that this charge would be no more than by the present uncertain means; and also that there would be almost a certainty of success in the recovery, and at no risk to the owner or Underwriter of the property. It is scarcely possible to over-estimate the importance to the shipping interest, and especially to Underwriters, in having at command a machine capable of saving, with certainty and despatch, wrecked property; and a company undertaking operations of this kind, with such an apparatus, would certainly realise larger dividends on the stock, than from any ordinary investment of capital.

There are other useful purposes to which the apparatus may be applied, as for example, transporting heavy machinery from one port to another, lifting and depositing large masses of stones or masonry to form breakwaters, piers, &c., for which the salvage steam ship is admirably adapted.

STRETCHING AND DRYING MACHINE FOR PIECE GOODS.

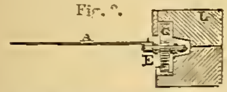
A GOOD arrangement of a stretching and drying machine has been recently introduced by Mr. John Dunbar, engineer, Drygate Toll, Glasgow. The accompanying engravings represent, at fig. 1, a longitudinal elevation of the machine; fig. 2 is a sectional elevation of a portion of

Fig. 1.



the chain or band of the machine, looking upon the fabric hooked on to it; and fig. 3 is a plan corresponding to fig. 2. The pieces of goods to be finished are joined together end to end, and arranged in a heap at the entering end of the machine. The fabric, A, passes up over the first roller, B, round the first drying cylinder, C, down under the second roller, B, and round the second drying cylinder, C. The fabric, after passing round and under the two rollers, B, is carried over the tension and stretching bar, D, on to the endless stretching belts, E. These belts are formed of bands of iron connected to each other by means of pitch links, F, so as to form a pair of flexible endless belts, extending longitudinally on each side of the machine. The endless bands, E, are carried round a pair of pitch wheels, H and I, fitted on horizontal shafts at each end of the machine; and have antifriction rollers, G, fitted in every alternate link of the bands, E, to facilitate the traverse of the belts, E, along the grooves in the guides, L and M. The bearings of the shafts which carry the wheels, H and I, are fitted in the projecting bracket pieces of the end standards, J. Between the end pieces are arranged the side standards, K, which support the upper guide rail, L, and the lower one, M. The belts, E, first traverse along the guide rails, L, and then return through the lower ones, M, after passing round the pitch wheels, I. These wheels have slots cut in their rims to allow the rollers, G, to go into, so that the bands are flat on their peripheries. On the inner margins of the belts, E, is fixed a series of tenter hooks, and the cloth, as it passes on to the end wheels, H, is pressed on to these hooks by the brush rollers, N, the supporting brackets of which are fixed to the rails, L. As the cloth leaves the first pair of wheels, H, the rails, L, widen out a little, so that the cloth is stretched to its full extent between the tenter hooks. Motion is communicated to the belts, E, and the wheels, H and I, by means of the belt, O, which is driven from the engine or prime mover. The pinion on the belt pulley drives the spur wheel, P, which is fast to a transverse horizontal shaft; a pinion on this shaft gives motion to a spur wheel, Q, fitted on the shaft which carries the pitch wheels, I. The cloth, after passing along the lower rails, M, is taken off the stenter pins and carried over the guide rollers, R, till it reaches the tension or pike roller, S, and is finally wound on the beam, T, in a finished state. The beam, T, is driven by frictional contact with the tension roller, S; the beam, T, is kept in contact with the pike roller by means of a counterweight, and it is arranged in adjustable bearings, so that it moves outwards as its diameter increases with the winding on of the cloth. The passage of the fabric in contact with the drying cylinders serves only to dry it partially: the drying is effected by its passing over a system of steam pipes arranged longitudinally in the machine. These steam pipes are arranged in tiers, the steam enters by the pipe, V, and passes along the upper tier, W, thence it travels along the central tier, X, and downwards to the lower range, Y, and out by the laterally projecting pipe, Z. The pipes are arranged with a sufficient inclination to carry off the water of condensation.

Fig. 2.



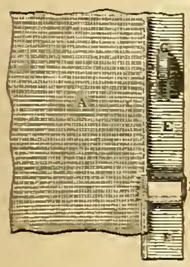


Fig. 3.

An important feature in the arrangement of this machine is that it occupies only one-half the length of the ordinary kind, so that it may be erected in a building of moderate length. The machine has been erected at the Print Works of Messrs. Hugh Aitken & Co., Camlachie, Glasgow, where, by its means, from six to seven hundred pieces of mill cloth have been dried per day, and from four to five hundred pieces of jaconet. It has also been found most satisfactory in drying dyed goods of the Turkey red, purple, green, or orange colours.

HISTORY OF THE SEWING MACHINE.

ARTICLE XXIX.

Provisional protection was granted to George Macbeth on the 16th of January, 1858, for a peculiarly formed curved guide to be employed in binding fabrics. The edges of this guide are turned inwards to retain the edges of the braid, and as it passes through the guide, it is gradually doubled or folded round the edge of the fabric, which also passes through the grooved or tapered end of the guide, and the fabric is delivered from the guide with the braid properly fixed round or enclosing its edge; the needle then descends through the braid, and produces a covered or bound edge by self-acting means.

Mr. William Muir obtained a patent on the 20th of January, 1858, for improvements in stands suitable for copying presses and sewing machines, his invention consisting in making recesses or holes in the base plate to receive bolts, by which the legs or supports for such base plate are secured thereto.

A patent was granted to Richard A. Brooman on the 1st of February, 1858, for improvements in sewing machines, communicated to him from abroad, which improvements are designed for employing a barbed needle, instead of one having an eye near its point as usual, and consists, firstly, of a means of actuating the needle whereby its movement through the material to be sewn, shall also produce the feeding of the same along; and secondly, in a method of regulating the vibration of the needle, whereby the feed for giving the various lengths of stitches is obtained. Fig. 196 represents a front elevation of the apparatus, with the table in section, and fig. 197 is a side elevation and partial longitudinal section of the same. A, is the needle, secured to the needle bar, B, which plays up and down beneath the table in a vibrating guide piece, C. At its lower end the needle bar is connected with a crank, D, the rotation of which gives both the up and down motion to the needle, as well as its vibrating motions. The needle bar, C, is pivoted at its top at C^1, on a screw pin which passes through a vertically slotted hole in an upright stud, E. Immediately at the back of this guide pin is a flat circular plate, I, having cut through it a spirally curved slot, I^1. The pin, C^1, passes through this and is held by it from slipping up and down in its slotted hole in the stud, E. This plate is secured on a centre screw, I^2, upon which it revolves, and by which it is also screwed up and made fast in any position desired. Above the table is a pressure pad or foot, O, capable of being raised and lowered by a set screw; the foot of this pad has a long, narrow slot in it, cut in the direction of the feed of the cloth—this slot is directly over the needle, so that when its point ascends above the table, it will enter the slot.

Fig. 196.

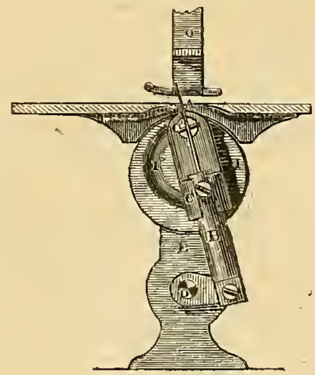
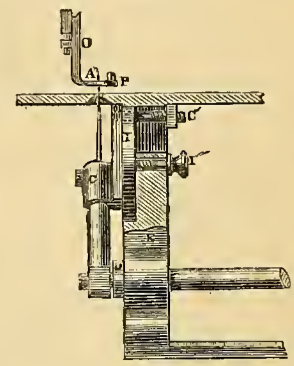


Fig. 197.



At one side of the slot is an eye, P, through which the thread is passed in sewing. In sewing by this machine, on giving motion to the crank, D, the needle bar will receive a reciprocating motion along the guide, C, which latter will oscillate to and fro upon its centre, C^1. As the needle passes this centre, that part of it which is beyond will vibrate to and fro in the same manner that the needle bar does on the other side. As the crank, D, turns round until it is at its lower centre, the point of the needle will come beneath the table; it then ascends and passes through in in a slanting direction, as well as through the cloth. The crank continuing to revolve, the needle begins to be withdrawn, but at an angle the reverse of that at which it entered—thus moving along the slot in the presser foot, and carrying the cloth, which is held between it and the table, also along with it, thereby forming the length of a stitch. As the needle reaches its greatest height, the end of the barb having risen above the presser foot, seizes the thread through the eye, P, by the act of changing its angle of position, the thread at that time lying across its path; the barb is then closed by being pressed into or against the shank of the needle, so as to admit of its passing out of the cloth without being caught therein. A loop of thread is thus drawn through the cloth and held on the shank until the next stitch is formed. As this is being taken, the closed end of the barb passes through the former loop, and that is accordingly cast off, and the last one drawn through it and held upon the needle shank, the same movements producing the well-known tambour stitch. The length of the stitch is regulated by the position of the axis pin, C^1. When this is up close to the table, the stitches are fine, being made gradually coarser by lowering that pin. This is effected by loosening the nut, I^2, so that the plate, I, may be turned round. If this plate be then turned from left to right, the pin, C, will travel along the spiral slot, I^1, and will consequently be lowered in its slotted hole in the stud, E, thereby increasing the vibrating throw of the needle at the level of the table.

John Avery obtained provisional protection on the 4th of February, 1858, for a means of obviating certain defects in the working parts of sewing machines. In sewing machines worked by cams, it is well known that the work can only be done when the cams rotate in a certain direction, and when a crank is used, the machine is liable to be frequently stopped with its crank on the wrong side of its centre: to obviate this, and prevent machines moving in any but the right direction, a roller is here adapted in conjunction with the fly-wheel (or other governing part of the machine), moving in a conical recess, and brought into action either to hold or release, automatically, by the friction of its surface contact with, and by the motion of the machine.

A patent was granted, in behalf of a foreign correspondent, to A. V. Newton, on the 12th of February, 1858, for an apparently identical invention with Brooman's, which we have above described and illustrated. The claims made are—*first*, The combination and use of the crank shaft with the needle bar as a means for operating the needle (secured to the upper end of the needle bar), to form the stitch by the single and direct action of the rotatory crank, and without the intervention of a second needle or other working parts. *Second*, the use of an oscillating guide in combination with the needle bar and crank shaft, in the manner and for the purposes specified. *Third*, the use of the stitch regulator plate, having a graduated curved opening in it, or other analogous device in combination with the oscillating guideway, in the manner and for the purpose specified. *Fourth*, the use of an elastic presser plate, having an eyelet and a barb or hook-closing projection upon it, as specified. *Fifth*, the combination and arrangement of the whole of the parts as specified, for making a cheap toilet sewing machine.

A. V. Newton obtained another patent on the 12th of February, 1858, for improvements communicated to him from abroad. The object of this invention, which is of rather a complicated nature, is to imitate by machinery the action of the human hand, in the production of what is usually known as the "button-hole" stitch. The claims are—*first*, The combination of two piercers for operating the needle in combination with a hook for forming the loop as specified. *Second*, the mechanism for giving a lateral movement to the cloth, so that the needle may descend through the cloth and rise through the slit (of the button hole) in combination with the mechanism by which the needle is operated, and the loop formed as specified in the production of the "button-hole" stitch. *Third*, the peculiar mechanism for imparting a curvilinear movement to the cloth, which gives the eyelet form to the end of the button hole, in combination with the mechanism for forming the stitch as specified.

A patent was granted to R. A. Brooman for an invention communicated to him from abroad, on the 15th of March, 1858. This invention relates to the single thread chain stitch machine, and refers principally to the looping, feeding, and thread tension apparatus. The loop is caught, held, and spread or opened by means of one single piece vibrating in a simple manner upon an axis, the vibrations being timed with the movements of the needle to produce the several effects referred to. This looper consists of a hook fixed to the end of a spindle or shank, and shaped in a peculiar manner. It is placed beneath the table with its spindle or shank in an inclined position, the box in which it is held being a long bearing to keep it firm. The feeding mechanism consists of a vibrating vertical bar, having a curved foot roughened on the underside. The needle passes through the foot, which thus serves as a stripper as well as a feeder. The tension apparatus and the spool carrier are combined together and attached to the head of the needle bar. It consists of an arm extending from a post having a screw cut upon it, and upon which screw the arm can be turned. The outer end of the arm has a spindle turned downwards, to hold the spool which is retained thereon by a nut. A set nut is also used for fixing the arm when the proper tension is obtained. In the first mentioned arm there is a branch piece having a hole made therein for the passage and guidance of the thread upon the tension post. By this arrangement no "take-up" for the slack is requisite, as the whole moves up and down with the needle.

Daniel Harris, of the United States of America, obtained a patent on the 20th of March, 1858, for certain improvements in sewing machines; but as the specification is very long, and the invention is not described apart from the drawings, we give the claims made by the patentee, which are—*first*, The mechanism for forming and interlooping the stitches, consisting of the looper (with its beak and needle guard), the thread catch, the spring and needle, as specified. *Second*, communicating to the feed finger (from the needle carrier in its vertical movements) intermittent forward and backward motion, by causing a pin or projection from the needle carrier to work between two nearly parallel inclines, being adjustable for the purpose of giving a greater or less vibration to the lever, to which the inclines and feed finger are attached as specified. *Third*, a peculiar device for applying tension to the thread during its passage from the bobbin to the needle, that is to say, causing it to run through the eye of the spindle and between two discs of parchment, when such discs are placed upon the spindle between two India-rubber tubes or cylinders, which admit of being compressed in the direction of the axis of the spindle, to any degree of intensity required, as specified. *Fourth*, applying an India-rubber or gum elastic annulus or ring to the periphery of a pulley as specified, and hinging the machine to which such pulley is attached to its supporting table, in such a manner that when the machine rests upon proper supports, the rubber covered pulley will be in coutact with the driving wheel as specified. There is no novelty whatever in this claim, as our readers will see on referring to our notice last month of John Henry Johnson's patent of the 15th of July, 1857, communicated from Mr. J. E. A. Gibbs, of the United States. The identical arrangement is covered by the *seventh* claiming clause of the specification of that patent.

A patent was granted to A. V. Newton for an invention communicated from abroad on the 20th of March, 1858; the first part of which relates to sewing machines wherein eye pointed needles are used, and consists in the application and use, below the table of the machine, of a pair of elastic nippers, carried by a sliding bar having a to and fro reciprocating motion, their object being to seize the thread as it is protruded through the cloth by the needle, and draw it away from the needle in such a direction and to such a distance, as to leave plenty of room for the passage between it and the needle of the looper, shuttle, or other contrivance operating in combination with the needle, to effect the enchaining of the single thread or the interlacing of the two threads, thereby preventing the failure of the looper, shuttle, or equivalent, to enter the loop and the consequent missing or dropping of stitches. The second part of the invention relates to the use of a looper of a novel description, operating in combination with a needle having an eye near its point, to sew with a single thread in what is known as the chain or tambour stitch. This looper resembles somewhat in appearance a pair of nippers, being composed of two prongs jointed together by a pin, which also attaches them to a sliding carriage working in guides on the underside of the table, and sliding in a direction parallel with that of the feed motion, and consequently at right angles to the movement of the spring nippers when they are used in combination therewith.

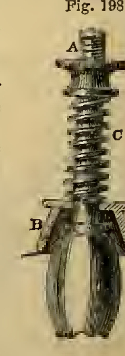
John Henry Johnson obtained a patent for an invention communicated to him from Mr. Samuel Comfort, on the 14th of April, 1858. Our readers will find a full description of this machine at page 293, vol. iii., (second series.)

Provisional protection was granted on the 14th of April, 1858, to John G. Hodges for an embroidering machine, wherein the fabric is held in a sliding frame, and operated upon by a number of needles.

John Henry Johnson obtained a patent on the 17th of April, 1858, for an invention, communicated to him from Messrs. Grover, Baker, & Co., the well known makers of sewing machines in America. This invention is fully described and illustrated at page 11, vol. iv., (second series.)

John Drake obtained provisional protection on the 19th of April, 1858, for the use of a hollow needle for supplying the under thread to ordinary sewing machines, or a tube with one end made up solid and pointed, the other end having a lid or cap screwed thereon, so as to be capable of being readily removed and re-attached. A cop or bobbin is placed inside this hollow needle or tube, the thread being drawn out through a hole in the cop. The needle is bent or curved into the segment of a circle of any suitable size. A plate is used having a circular groove formed in one side or face near its outer edge, the size of such groove being sufficient to receive the curved hollow needle, so as to allow it to slide freely in the circular groove. This plate or disc is fixed to the underside or bed-plate of the machine in such a position, that the vertical needle of the machine will pass close to the outer circumference or periphery of the circular hollow needle, at a point where a notch is cut in the disc across the groove, to receive the vertical needle and the loop which is formed on the thread by the withdrawal of the vertical needle. The curved hollow needle is impelled through the loop by means of an arm fixed on a spindle, which passes through the centre of the disc, and is caused to rotate therein by mitre wheels, or other suitable contrivance. The curved hollow needle is caused to circulate or make one revolution to each stroke or insertion of the vertical needle, so that the thread supplied by the hollow needle passes through the loop formed by the vertical needle, one thread crossing the other at each stitch, consequently producing a stitch on each side of the fabric alike.

Fig. 198.



On the 26th of April, 1858, A. T. Emery, of the United States obtained a patent for an invention consisting in a combination of a chain-stitch sewing mechanism, and a mechanism for introducing an interlooped binding thread through each loop of the chain stitch. The object being to prevent the thread of the chain stitch from unravelling—and this is accomplished by the introduction into each loop of the chain stitch sewing an unlooped thread—such thread being drawn up against the cloth by the loops of the chain stitch sewing. The inventor also describes a tension apparatus of simple construction, for regulating the tension of the needle thread. Fig. 198 represents a section of this apparatus in action. A, is a screwed stem, upon which slides freely the inverted thimble, B, formed with rounded edges, which press upon the thread as it passes through a hole in the lower part of the stem. C, is a helical spring which presses down the thimble, its power being regulated by the adjusting nut, D.

A patent was granted to E. T. Hughes on the 22d of May, 1858, for a mode of embroidering, whereby a pattern is produced at the same time that the fabric is woven, but there is little or nothing in common with the sewing machine in this invention.

THE ROYAL AGRICULTURAL SOCIETY'S SHOW.

The ancient city of Canterbury has been this year chosen as the site for this great annual gathering of agriculturists, agricultural implement makers, and their friends. The old city adorned itself with the usual floral arches, banners, and other insignia of welcome, and put on an appearance of life not often to be seen there.

In consequence of disputes between the society and the principal firms of implement makers, the well known names of Clayton & Shuttleworth, Garret, Hornsby, Ransomes, Tuxfords, Howards, and Samuelson, with others of somewhat lesser note, did not appear as exhibitors, although many of their productions were on the stands of other makers and agents.

The exhibition was held on a portion of the estate of the late Sir Edward Halls, about a mile from the city, and the trial fields were conveniently situate near to the showyard, and consisted of clover lea and pea stubble for the steam ploughs, and grass and rye crops for the mowers and reapers. Out of eight competing mowing machines, four made exceedingly good work, these being those of Burgess and Key, Wood, and Prentice. Several machines displayed the common fault of defective cutting power in proportion to the speed travelled. The reapers were tested in a piece of very light upstanding unripe rye, a crop which formed no test for the delivery apparatus, though the rough surface of the hilly field afforded a good test of the cutters. Nine machines competed. Burgess and Key's reaper, with M'Cormick's sickle-edged knives and screw platform, accomplishing a perfect side delivery, performed well. Prentice's Harwood reaper made good work, accomodating itself to every unevenness of ground by means of a supporting wheel beneath the middle of the platform. Hellard's new machine, both a reaper and mower, possesses an important improvement in the sloped finger-guards preceding the cutters, so as to lift up a prostrate crop instead of passing over it without cutting. Cuthbert's one-horse machine showed the effectiveness of simplicity of parts and the value of its rocking motion for reducing friction. Dray's champion reaper, and an improved machine enabling the raker-off to deposit the corn by side delivery, both worked fairly. Wood's American machine did well, and his new reaper, with novel self-raking-off movement, excited much attention.

Mr. Fowler exhibited his twelve-horse double cylinder engine with hauling groove-drum attached beneath the boiler, manufactured by Messrs. Kitson & Co., of Leeds. A ten-horse engine, with simpler details, was also shown, both being self-propelling, with broad-felloed wheels over field roads. The self-shifting anchorage is improved in minor details; the implements were a four-furrow balance plough, which also worked as a cultivator with the appliance of different breasts, and a balance plough having shares and wrests, like the Kentish horse-plough. The straight, well-laid work on the clover lea and pea stubble is the best the steam plough has yet produced, and the smashing up was most effectively and thoroughly performed.

Robey's apparatus (Chandler and Oliver's patent) consisted of a stationary ten-horse, double-cylinder engine (which is also locomotive for farm roads), with winding drums hung on each side the boiler upon the carriage-wheel axle, and driven by spur gearing from the crank shaft, a three-furrow balance plough, which, with other breasts, makes an admirable cultivator, and the wire ropes laid out in either a rectangular or triangular form, to compass the length of furrow between the moveable anchored pulleys. Eddington's two ordinary portable eight-horse engines mounted upon two winding machines at opposite ends of the field, and working two of Fowler's three-furrow balance ploughs, ploughed, in the light land piece, about one acre per hour.

A Buckinghamshire farmer, Mr. Beard, ploughed about one-third of an acre per hour, using only a two-furrow implement. The windlass, pulleys, &c., and the method of shifting over the plough at the ends of the furrow for ploughing in ridge or stetch, are all ingenious.

Coleman's steam scarifier also worked well.

After watching for some time the work of these several implements, we were irresistibly compelled to conclude, that although much has been done since former years, very much still remains to be done before steam ploughing will become at all general. The excessive power required, and the very great cost of the implements, with the nicety required in their management, render them at all events for the present, only available for farmers, who are at the same time large capitalists.

The judges of the application of steam power to cultivate the soil, awarded a well merited prize of £90 to Mr. Fowler, and £10 to Messrs. Robey and Co., for a complete set of patent steam ploughing tackle.

We were sorry to miss from the trials the steam ploughing apparatus of Mr. Williams, of Baydon, and also of Mr. Smith, of Woolston.

Mr. Hancock's pulveriser plough was exhibited in the same field. This implement is designed for the preparation of the land for seed at one operation, and it appeared to us to be capable of excellent work.

Amongst the steam engines exhibited was a locomotive of Mr. Aveling, of Rochester, eight-horse power, manufactured by Messrs. Clayton and Shuttleworth. This engine appeared to us to be of especial mark, and we hope at a future day to give some further particulars as to it.

Amongst the steam engines of a smaller class those of Mr. Heywood, of Derby, appeared to be the most popular.

Steam engines were also exhibited by the newly formed Agricultural Engineers' Company, and, by the way, had one of the largest stands on the ground. Ruston and Co., of Lincoln; Maggs and Hindley, of Bunton, Dorsetshire; Brim and May, of Devizes; Williamson, Brothers, of Kendal; Butlin, of Northampton; Howard, Riches, and Watts, of Norwich, and many others.

Ericsson's caloric engine, exhibited by the Agricultural Engineers' Company, was perhaps the greatest novelty in the field. The advantages claimed for it are, that it effects a saving of two thirds of the fuel, extraordinary simplicity of parts, rendering all skilled labour unnecessary, absolute immunity from danger, and working altogether without water.

The introducers state, that upwards of 3,000 of these engines are now at work in the United States, and a host of testimonials, of the true Yankee order, attest their efficiency. We shall be glad to hear reports as to the working in this country.

Mr. Nalder, of Challow Works, Wantage, exhibited one of his winnowing machines and combined thrashing machines, with his new cleaner for his circular screw and separater. Messrs. Tasker and Sons, of Waterloo Iron Works, Andover, also exhibited one of their single fan thrashing and winnowing machines, with their improved patent straw shaker attached. In this machine the same fan works a blast on the grain as it passes through both dressing machines, and the straw shaker being worked by one crank, the straw receives more tossing than in shakers of the ordinary construction.

Professor Thomson's patent vortex turbine was exhibited by Messrs. Williamson, Brothers, of Kendal. The exhibited turbine is designed for a fall of forty-six feet, and with a supply of four cubic yards per minute yields seven horses power.

The other makers prominent in the show were—Bentall with his broadsharers, new chaff-cutters, bean-cutters, &c.; Ashby and Co., with their chaff-cutters, engines, and circular harrows; Page and Co., including their iron ploughs, harrows, chaff-cutters, hay rakes, and brick-moulding machines; Warner and Sons, pumps; Bradford, washing, wringing, and mangling machines; trustees of W. Crosskill, corn-mills, bone-mill, carts; Bayliss, hurdles and fencing; Humphries, thrashing machine; Fowler, pumps; Coleman, cultivators; Barnard and Bishop, root-cutters, fencing, garden ornaments; Richmond, Chandler, and Norton, chaff-cutters; Boby, corn screens; Smith, horse-hoes; Bonds and Robinson, steam engines, horse-rakes, horse-hoes; Turner and Co., mills; Picksley and Sims, chaff-cutters; St. Pancras Ironwork Company, stable-fitting, gates; Reeves, water drill; Hill and Smith, cultivators, wire netting; Greening, fencing; Mapplebeck and Lowe, large collection of implements; Woods and Sons, mills and pulpers; Ball, ploughs; Newton and Wilson, sewing machines; Perry, fencing; Dray and Co., collection of machines; Foord, ploughs, horse-rake, and a butter-making machine; Lawson and Son, collection of seeds, grains, &c.; Thomas Gibbs and Co, a large show of dried specimens of permanent grasses, wheat and other grains in ear, both British and foreign; collections of rare produce in roots.

We also particularly noticed a very neat and compact arrangement of washing, wringing, and mangling machine, invented and exhibited by Mr. Isaac James, of Tivoli Works, Cheltenham.

Messrs. M'Naught and Smith, of Worcester, exhibited some very elegant carriages, of which a waggonette, with concealed fold steps to the lady's side of the driving seat, and also to the hind door, struck us as being one of the most useful, and, at the same time, most symmetrical carriages we have lately seen.

As the show was held in the centre of a large hop growing district, prizes were of course offered for hops, of which thirty specimens were shown, the greater proportion of which were Golding hops. The catalogue states the age of the plantation, the weight grown per acre, and the date of picking.

In drying hops in the "oast-houses," the object is not only to expel the moisture from the green hops, but to carry away the vapour thus driven off as quickly as possible, which is effected by causing currents of heated air to pass upward through the haircloth flooring, upon which the hops are spread in a thin layer. Sulphur is very generally employed as an agent in the process, its bleaching properties being beneficial to the colour, while the sulphurous acid tends to absorb the vapour. Of course hop-drying is open to all sorts of ingenuities, and several forms of apparatus for supplying a constant upward stream of hot air, and also designs for suitable buildings in which to carry on the process with perfection and rapidity, were present in the show. It is important for hops to be packed as soon as possible after they are dried. The common mode of bagging by treading the hops under the feet breaks and crushes the flower, and is a very unhealthy operation, so that machines have been contrived for improving and expediting the process. By these machines the hops can be pressed into the bags quite hot without damage, while a greater weight is put in, and the hops keep much better. Week's machine, which takes the prize, is very simple and efficient, the hops being pressed down into the bag by a piston, which is afterwards quickly raised by a counterbalance for another operation.

THE GREAT EASTERN.

The great event of the past month, in the engineering world, has undoubtedly been the visit of the *Great Eastern* to the shores of the United States—an event long expected and much delayed. The huge steamer set out from Southampton on the morning of the 17th of June, and reached New York on the morning of the 28th. The entire voyage occupied eleven days and two hours, without making any deduction for stoppages to sound, or for delays on account of the fog encountered by the vessel on the American side of the Atlantic. Her average run by the log was thirteen knots an hour. The route taken was, it appears, not the shortest; and there was nearly a day's loss of time on this account, and further delay was occasioned by the foul state of her bottom. The passage has been repeatedly effected in a shorter period, and the vessel has therefore her laurels yet to win in regard to shortness of transit. The engineers, however, promise greater celerity on the return voyage, and some persons think that sixteen knots an hour ought to be got out of the ship under favourable circumstances, whilst with a clean bottom, her average rate will be from fourteen to fourteen and a-half knots. It is reported that both the screw and paddle engines did their work with perfect ease and smoothness, and that the engineers have great confidence in their future satisfactory performance.

The following tabular statement of the work performed by the two sets of engines will be interesting to our readers:—

PADDLE ENGINES.—150 FEET EACH REVOLUTION.

Date.	Distance in Statute Miles.	Revolutions of Engines.	Statute Miles Run by Engines, less one eighth slip.	Average Revolutions per Minute.	Pressure of Steam in Engine-Room.	Tons of Coal.
June 18	346	13,978	341	9·0	15	107
„ 19	340	13,459	328	9·3	17	102
„ 20	317	13,939	340	9·9	19	103
„ 21	349	14,535	360	10·0	19	124
„ 22	332	14,426	358	10·0	19	117
„ 23	347	15,126	375	10·0	19	114
„ 24	345	16,058	399	10·5	23	120
„ 25	376	16,848	416	11·1	24	120
„ 26	382	17,588	433	11·7	24	120
„ 27	291	15,645	387	12·2	20	108
„ 28	269	12,724	316	11·1	16	66
Total,	3694	164,326	4053			1201

Density in boilers at $1\frac{3}{4}$.
Vacuum in engine-room, $25\frac{1}{2}$ to 26 inches.
Four P.M., 26th, 3676 horse power indicated.

SCREW ENGINES.—PITCH OF THE SCREW—44 FEET.

Date.	Revolutions.	Statute Miles less one-eighth slip.	Revolutions per Minute.	Pressure of Steam.	Tons Coal.	Total Coal.
June 18	45,500	331	31·5	16	138	245
„ 19	45,136	329	31·3	17	154	256
„ 20	47,180	344	32·7	17	186	289
„ 21	50,478	378	35·0	18	171	295
„ 22	49,466	361	34·7	17	149	266
„ 23	50,278	367	34·9	18	150	264
„ 24	52,707	392	36·5	18	163	283
„ 25	51,419	375	35·7	18	149	269
„ 26	52,096	384	36·1	18	178	298
„ 27	47,406	346	30·3	18	142	250
„ 28	40,368	294	35·0	16	96	162
Total,	532,334	2901			1676	2877

Vacuum in engine-room, $23\frac{1}{2}$ to 26 inches.
Horse-power, 3976, June 26.

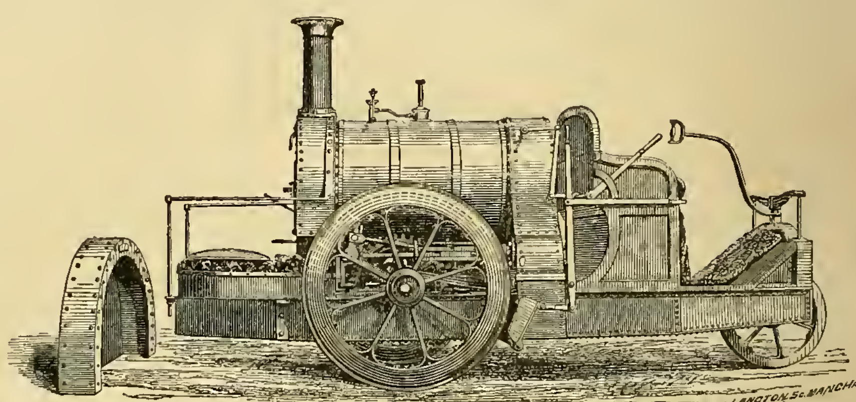
TABLE OF DISTANCES RUN.

Date.	Lat. N. D.	Lat. N. M.	Long. W. D.	Long. W. M.	Distance made.	Date	Lat. N. D.	Lat. N. M.	Long. W. D.	Long. W. M.	Distance made.
June 18	49	27	7	54	300	June 24	41	01	48	50	299
„ 19	48	41	16	12	340	„ 25	40	58	56	10	325
„ 20	47	40	22	54	276	„ 26	40	58	63	31	333
„ 21	46	16	30	03	304	„ 27	40	13	68	56	254
„ 22	44	50	36	14	276	„ 28	...	...	...	...	...
„ 23	42	50	42	40	301						

LOCOMOTIVE CARRIAGE FOR COMMON ROADS.

In our *Journal* for August last, at p. 119, we described and illustrated a road locomotive engine, constructed by Mr. Thomas Rickett, of the Castle Foundry, Buckingham. Since that period, this gentleman has continued to direct his attention to further improving the arrangement of these machines. We are informed that our article led to an order for a steam carriage for Belgium, in which improvements suggested by practical experience were introduced. The engine was made a size larger, having $3\frac{1}{2}$ inch cylinders instead of 3 inch, and working at 160 pounds pressure instead of 110 pounds. Upon trial, the engine was found to travel exceedingly well, to run smooth and steadily, and maintain a speed of sixteen miles an hour with ease upon a good road, without priming. Mr. Rickett drove this engine from Buckingham to Windsor Castle, and her Majesty, the Prince Consort, and the Royal Family were pleased to inspect it, and express a favourable opinion of it. Upon a subsequent trial, in a journey of seventy miles, the engine was driven a portion of the distance by the Earl of Caithness, whose active and energetic mind leads him to take a warm interest in the development of mechanical improvements. The trial gave so much satisfaction that Mr. Rickett received an order to build for his lordship an engine precisely similar, for use on the Caithness estates.

The engraving accompanying the present article, represents an elevation of the engine in its improved form. The cover of the off side



driving wheel being removed to show the arrangement of the engine. The framing of the engine is constructed of boiler plate, so as to form a tank capable of holding eight cwts. of water. The engine runs upon three wheels, the leading wheel being carried by a fork supported by springs. It is moved upon its axis by means of the steering handle, so that the engine is easily guided, and may be turned completely round without stopping in any ordinary road. Mr. Rickett has done away with the pitch chain and wheels which were employed to communicate the motion of the engine to the driving wheels of the carriage built for the Marquis of Stafford; and in lieu of this arrangement, has placed the crank shaft behind and above the carriage axle, which it drives by means of spur wheel and pinion. The pedestal bearings of the driving wheels are supported by springs, and play between guides set at a considerable angle to the line of motion, but at right angles to the centre line from the crank shaft to the driving axle, so that the play of the springs does not materially affect the spur wheel gearing, the central distance varying but little, and the momentum of the crank shaft, &c., being too small to produce any sensible effect. There are two sets of spur wheels and pinions, giving proportionate speeds of ten and four miles per hour, so that in ascending steep hills, by shutting off the steam and moving a handle, without actually stopping, the pinions on the crank shaft are changed, and the power multiplied two and a half times more. The steam cylinders are three and a half inches in diameter, and seven inches stroke. The front seat of the engine affords ample space for three persons; the steam regulator and brake handles being immediately contiguous to the driver's right hand, and the steering handle to the left hand. The stoker's place is at the back of the engine, his seat forming a chest for carrying the necessary tools. The tank contains ninety gallons of water, which is sufficient for a run of ten to fifteen miles. The weight of the engine and carriage is one and a half tons, and with a full complement of coal, water, and passengers, the weight is two and a half tons, requiring an actual development of ten horse power at a high speed.

The carriage now being built for Lord Caithness is to be provided with a folding head piece over the front seat, so as to protect the passengers from rain or the heat of the sun. Although we can hardly hope to see these locomotives in common use on roads, yet there are localities where their services may be made eminently useful.

In our former article on this subject, we drew attention to the circumstance of a bill being in progress through the Commons, the object of which was to reduce the rate of tolls on road locomotives. A correspondent of the *Times* has recently referred to the subject, and points out the ridiculous disproportion of the rates; we transfer his remarks to our columns:—

"I was glad to see, by the observations in your article, in reference to traction engines on common roads, that you are coming to our rescue. You are, however, in error in speaking of the present as the first effort of legislation on the subject. The first effort was made as long ago as 1831, when a far more liberal bill, intended to relieve us from the exorbitant tolls which have ever since prevented our using steam on the turnpike-roads, after being referred to a select committee, passed the House of Commons, but does not appear to have gone any further.

"I am not aware to what extent this prohibition (for such in effect it is) exists in the neighbourhood of London; but I need only mention the fact that on coals from the collieries at Little Hulton, drawn into Manchester, a distance of eight miles, by horses, the turnpike tolls amount to about 3½d. per ton, whereas if drawn by steam they would, under the existing rates, amount to fully 4s. per ton. It was proved to the satisfaction, of the select committee, to whom the subject was again referred in the last session of Parliament, that traction engines are now made which do far less injury to turnpike-roads than the feet of the horses which would so far be superseded; and, as the doubt on that subject was the only ostensible excuse for imposing these extortionate and prohibitory tolls, I trust you will give us your powerful aid in removing so unjust and absurd a restriction. "JOHN GIBSON.

"SALFORD, MANCHESTER, *June*, 1860."

It is surely high time that this anomalous state of things was rectified, seeing that there is evidently a desire to give steam a fair trial against animal power on common roads; being the only way of setting at rest the vexed question of the commercial advantages or disadvantages of steam carriages on ordinary roads.

RECENT PATENTS.

BEETLING TEXTILE FABRICS.

THOMAS AUCHINCLOSS, *Glasgow—Patent dated December* 30, 1859.

In the drawings appended to the specification of this invention the patentee has shown a simple and most effective mechanical arrangement to be used for beetling, washing, and finishing woven goods of various kinds.

Fig. 1 of the accompanying engravings is a front elevation of a beetling machine, arranged according to the patentee's improvements;

Fig. 1.

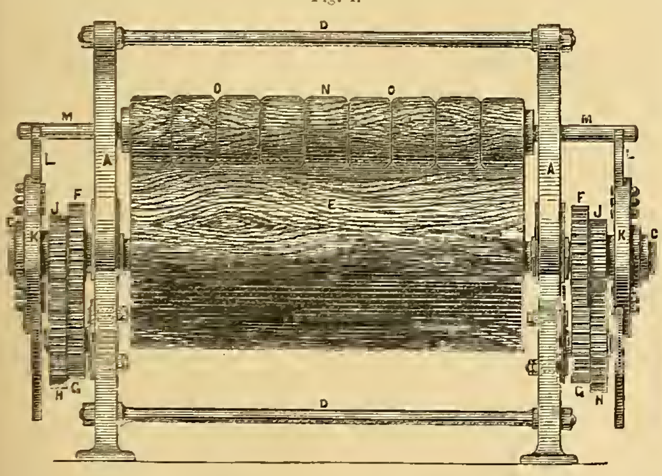


fig. 2 is an end view, and fig. 3 a vertical section showing another arrangement of beetling rollers. According to the first arrangement of these improvements, the machine is composed of two cast-iron vertical end standards, A, which are connected to each other at the upper and lower parts by horizontal tie rods. These standards are formed with an open panel at the lower part, the upper portion of the standard having two diverging slots, B, cast therein. Below these slots there is a rectangular opening in each standard, in which is fitted the bearings of the shaft, C. Motion is communicated to the shaft, C, from the prime mover, by means of an endless belt carried round the pulley, D, or in any other convenient way. The shaft, C, has fast to it the main horizontal roller or beetling beam, E, on which the fabric to be beetled is wound, the rotatory velocity of this beam being regulated by the size of the pulley on the shaft, C. Outside the standards, A, two small spur wheels, F, are keyed to the shaft, C; these spur wheels gear with the compound pinions, G, and spur wheels, H, which are cast in one. The pinions and spur wheels, G and H, are carried upon laterally projecting studs, I, that are bolted to the side standards, A. The wheels, H, give motion to the pinions, J, which are fast to tubular bosses running loosely on the shaft, C. The tubular bosses have cast in one with them, or keyed thereto, the wheels, K, to the rims of which are bolted the curved arms, L. These arms, when put in motion, act on the spindles, M, of the beetling rollers, N. There are two of these rollers arranged parallel to each other and resting upon the main beam, E. The spindles, M, are passed through the diverging slots, B, and extend outwards over the arms, L, so that as the wheels, K, are caused to rotate, the beetling rollers are lifted up and fall with a sharp blow on the fabric wound on the beam, D. In this reciprocatory movement, imparted to the beetling rollers, N, the spindles are guided in their traverse by the diverging slots, B. The velocity with which the beetling rollers are caused to rise and fall is regulated according to the size of the wheels imparting motion thereto, as well as the number of the arms, L. The peripheries of the beetling rollers, delineated in fig. 1 of the accompanying engravings, are grooved circumferentially, as shown at O; the grooves of one roller being formed so as to break bond, or come midway between the grooves on the contiguous roller. The rapid rising and falling motion imparted to the beetling rollers, combined with the action of the grooved surfaces, causes the goods that are wound upon the beetling beam, D, to be most effectually operated upon. Another arrangement of the beetling rollers is delineated in fig. 3. In this modification the end standards are arranged in a similar manner to those hereinbefore described as is also the beetling beam, E. The beetling rollers, N, are made with corrugated surfaces, the undulations running in a transverse direction, as shown by the sectional view, fig. 3. The ends of the spindles of these beetling rollers are passed through the diverging slots, B, in the standards, A, and no motion is communicated by means of gearing, as in the modification hereinbefore described. Upon the beam, E, being put in motion, the beetling rollers, N, are caused to rotate, by reason of their resting in contact with the goods wound upon the beam, the rapid rotatory motion of which causes the rollers to rise and fall in the slots, B. This rapid reciprocatory movement of the rollers, N, has the same effect as the arrangement shown in figs. 1 and 2, and serves to beetle the goods in a very effective manner. The surfaces of the beetling rollers may be corrugated or indented in various ways besides those shown in the accompanying engravings. With the aid of these improvements the operation of beetling textile fabrics is effected in a very speedy and efficient manner.

Fig. 2.

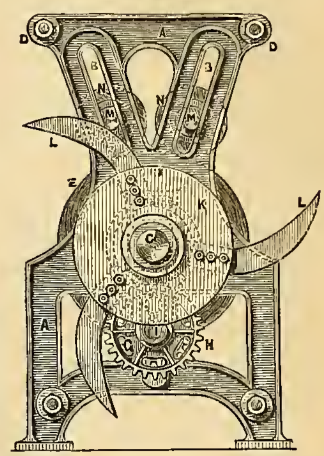
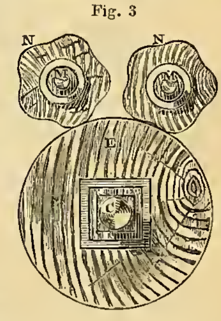


Fig. 3



TREATING WASTE INDIA RUBBER.

N. S. DODGE, *London*, (H. L. HALL, *Massachusetts, U.S.*)—*Patent dated May* 23, 1859.

THESE improvements relate to a system or mode of treating waste vulcanized India rubber, for the purpose of further and more efficiently carrying out the process described in the patentee's specifications of the 30th of July, and the 2nd of November, 1858. According to these inventions the waste vulcanized India rubber is treated by boiling and also submitted to the action of ordinary steam, either alone or in connection with water. But the object of the present invention consists in the restoring of the rubber to a state fit for re-manufacture by the application of dry heat. Various arrangements of apparatus for applying the dry heat may be used, the main object of the process being the application of the dry heat as generally as possible to the substance under treatment. For this purpose the patentee finds it desirable, but not indispensable to reduce the material in the first place to a powder by any convenient mechanical contrivance. The powdered waste vulcanized India rubber is then put into a revolving or stationary pan or other suitable receptacle, which is placed in a furnace or otherwise heated oven, by which the whole of the powdered waste is submitted to as nearly as possible a suitable degree of heat, 300° Fahrenheit being found to answer the purpose best, but it may be accomplished by any amount of heat varying from 100° and upwards. This heat is continued until the powdered waste becomes suitably plastic for the purpose to which it is to be applied. The patentee does not confine himself to this plan of dry heating, but adopts any that may be convenient and suitable.

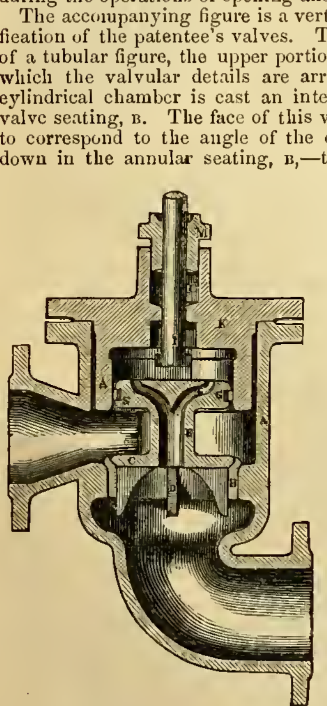
This invention further consists in the application of superheated steam for the purpose referred to. One plan which has been found convenient for this, though many others will answer, is to put the powdered waste into a double-cased cylinder heated by means of ordinary or superheated steam of a proper temperature, and continue the application of the heat with or without stirring the waste until the requisite plastic condition is obtained, the steam being simply used as a means of heating the vessel containing such waste vulcanized rubber or materials. If desirable, heat may be applied to the waste vulcanized rubber or materials by the direct application thereto of superheated steam. Care should be taken that a ready means of escape for the gases arising from the mass under treatment be adopted. The material treated by either of the processes above-mentioned is afterwards incorporated with the other materials described in the specifications of Mr. Dodge's patents before referred to, either by means of solvents, mechanical disintegration, or heat, and rendered suitable for manufacturing purposes in the manner described in the said specifications. The patentee has also obtained useful results by the addition to, say 10 lbs. of such material, of about 3 ounces of palm oil, 5 ounces of sulphur, 3 lbs. of lead or 1 lb. of carbonate of magnesia, ½ lb. of slacked lime, 4 lbs. of zinc and earths or clays, such as chalk or talc, separately or in suitable combinations, in suitable proportions. It is not advisable to use more than one of the oxides and carbonates or earths mentioned, in the same mass, for example, sulphur, lead, and palm oil, form a good combination, or palm oil, sulphur, and magnesia, or zinc, palm oil, and sulphur. The articles manufactured from this compound material may or may not, as found most desirable, be submitted to the action of heat.

VALVES.

John Paton, *Glasgow.—Patent dated December* 1, 1859.

This invention relates to the arrangement and construction of what are technically known as equilibrium or balanced pressure valves of the duplex class, the object of the invention being the general improvement of the working action of such valves, and the removal of the difficulties as regards the unequal and varying pressures upon the valvular details during the operations of opening and closing.

The accompanying figure is a vertical sectional elevation of one modification of the patentee's valves. The valve casing or chest, A, is made of a tubular figure, the upper portion forming a cylindrical chamber, in which the valvular details are arranged At the lower part of this cylindrical chamber is cast an internal flange, in which is fitted the valve seating, B. The face of this valve seating is bevelled and ground to correspond to the angle of the disc valve, C, which works up and down in the annular seating, B,—the feathers, D, on the under side of the disc, serving to guide the valve. The stem, E, which springs from the upper face of the disc, C, connects the disc with the piston or plunger, O; this piston has a groove formed in its periphery to receive a metallic spring packing. On the upper face of the piston, F, are formed two overhanging lugs, which serve to retain the lower T-shaped end of the valve-rod or spindle, I. The stem, E, of the valve is made hollow, and opens upwards from the lower face of the disc, C; this tubular passage communicates at the lower part of the piston, F, with two diverging rectangular channels, J, which open out on each side of the lugs. The cover, K, of the valve chest, A, is made sufficiently deep to admit of the lower part being bored out so as to form a small cylinder to receive the piston, F, which works steam tight therein. The valve spindle, I, works out through the stuffing-box, L, in the cover, K, which is fitted in the usual manner with the gland, M.



The steam, or other fluid, enters by the lateral passage shown to the left of the figure, and passes round the tubular stem, E, of the valve, and so exerts as much pressure on the lower face of the piston, F, in an upward direction, as it does on the upper face of the disc, C, in a downward direction. In this way, the valve is maintained in equilibrio, or in a state in which it is free to be moved in either direction, up or down, irrespective of the pressure of the steam, the force of which is neutralised by the arrangement of the contiguous surfaces of the parts C and F. The valve is supposed to be actuated in the usual way from the engine, the reciprocatory movement imparted to the valve being communicated through, or by means of, the spindle I. When the valve is raised, the steam, or other fluid, passes down into the tubular passage at the lower part of the casing, A, and thence to the engine, or other purpose to which it is applied. Upon the opening of the valve, the steam, or other fluid under pressure, passes also up through the tubular stem, E, and out by the openings, J, into the cylindrical space above the piston, F. By these means, the pressure which is exerted by the steam, or other fluid, on the under side of the valvular disc, C, is counteracted by an equivalent, or nearly equivalent force, exerted in the opposite direction on the upper face of the piston, F. In this way, the valve is kept in a state of equilibrium, and free to move in either direction with a trifling expenditure of power. These valves, while embodying the general principle of construction for obtaining the equilibrium of the valve under all circumstances, may, with trifling modifications, be readily adapted for controlling the passage of steam, or other fluids, to suit any particular class of machinery or apparatus where such a valvular arrangement is needed.

CALCINING ORES.

J. H. Johnson, *London and Glasgow* (Professor J. F. Persoz *Paris*).—*Patent dated May* 20, 1859.

The essential feature of this invention consists in the substitution for the draught of the ordinary chimney, of a physical or mechanical combustion, by means of which the products of combustion and noxious sulphurous vapours are collected and expelled at pleasure without any necessity for modification or change in the construction of the furnace, retorts or other calcining apparatus employed. As an example of the mode of effecting this object, the ordinary chimney may be replaced by an exhaust and force pump, suitably constructed, to withstand the heat of the vapours or gases, and also the corrosive effects of sulphurous acid. This pump draws all the products of combustion and sulphurous fumes from the body of the furnace, and directs them to any convenient locality, where the otherwise waste heat may be employed in the evaporation of liquids, or in the drudgery of substances generally; whilst the sulphurous acid, where existing, may be utilised either by direct application or employed in the manufacture of sulphuric acid. As the mixture of air, sulphurous acid, and products of combustion attain a very high degree of temperature, it is proposed to cause them to pass through chambers, or flues, suitably arranged, wherein they are partly cooled; and the particles of matter which may have been carried along with the draught are deposited before reaching the pump.

In the ordinary process of roasting of ores, reverberatory furnaces are employed of various forms and dimensions, but having this feature common to all—that is, that the hearth, which is formed with an arched top or cover, and over which are spread the ores to be roasted, communicates at one side with a chimney, the diameter and height of which depends upon the balance of air to be passed over the ore in a given space of time. The object, indeed, of this chimney is to create a draught or current of external air, and cause it to penetrate into the interior of the furnace, where it is required to assist the combustion of (1) the fuel, which is required to produce the heat necessary to the chemical action; (2) the ore, which in the process of roasting produces sulphurous gas and a metal, sulphurous gas and an oxide, and sulphurous gas and sulphates. On the other hand, this hearth communicates with the external atmosphere by as many holes as may be required for the easy introduction or removal of the ore, and for the stirring of the scum during the roasting, in order to facilitate the oxidation of the sulphur by the continual removal of the surfaces in contact with the current of air.

After having traversed the furnace, where it loses the greater part of its oxygen, the air enters the chimney, drawing off with it the sulphurous acid produced, which becomes dispersed and wasted in the atmosphere, rendering it equally hurtful to animal and vegetable life. The high price demanded for raw sulphur at certain periods has determined some manufacturers of sulphuric acid to utilise the sulphur of pyrites. For this purpose the pyrites are burnt in furnaces, or muffles, in proximity to leaden chambers, and the sulphurous acid arising from the burning or roasting process is caused to enter these chambers by means of a chimney erected at the opposite or farthest extremity of the chambers. But this process, besides that it is only applicable to certain kinds of sulphur is liable to cause great irregularity in the working of the leaden chambers, and prevents, by reason of the resulting products, the employment of many agents which would effect the desulphuration of the ores in a perfect and satisfactory manner.

The process which constitutes the principal feature of this invention is totally free from these objections; and if the best arrangements of ordinary furnaces be preserved, the improved process admits of the roasting or calcining of minerals containing sulphur without injury to health, and enables the whole of the sulphur contained therein to be utilised.

For this purpose the chimney, which has always been considered an essential organ up to the present time, is replaced by an exhaust and force pump, which, whilst producing the mechanical effect of the chimney by removing the sulphurous acid formed in the furnace, enables this acid to be utilised at will, either by direct application or by the manufacture of sulphuric acid, by its ulterior oxidation in suitable apparatus.

Since the mixture of air and sulphurous acid, which leaves the furnace, possesses a high degree of heat, it is proposed to pass it, before reaching the piston of the pump, through suitably arranged chambers or cavities, in which it is not only freed from any solid particles of matter which may have been mechanically carried along with it, but is sufficiently cooled down. The necessity for causing a circulation of the gas before using it, so far from being an objection, enables, on the contrary, a great portion of the hitherto waste heat to be utilised with profit, since it may be applied either to the evaporation of liquids, or to the drying of substances generally.

In roasting or calcining ores according to this invention recourse is had either to simple or complex reverberatory furnaces, such as are well known in the science of metallurgy; or to retorts of cast-iron or fire clay of a similar construction to those employed in gas works, with this slight difference, that their roofs are lower, in order to effect greater economy of heat; or to cylinders placed vertically; or to a species of muffler with a low roof. According to circumstances, the receptacle which is used for the desulphuration of the ore is closed, or open, and the ore heated directly by the flame circulating in the interior of the furnace, or indirectly by radiation from the sides; but in either case, the gas, as it passes from the furnace, retort, or cylinder, is immediately drawn into a passage or flue, divided into as many compartments as may be necessary to separate the matters held in suspension therein, and for effecting the cooling of the gas. The extremity of this flue, or passage, is in communication with the exhaust and force pump, which removes the gases and directs them to the apparatus intended for collecting the sulphurous acid, or for employing them in any other manner. Amongst the matter carried off by the gases are frequently found particles of arsenious acid in variable proportions, sometimes oxide of antimony, and always a considerable quantity of sulphuric acid arising from the decomposition of certain accidentally formed sulphates, as well as numerous small particles of raw or calcined ore.

In the calcining or desulphuration of ores according to this invention, different modes of treatment may be employed, according to the nature of the ore. For example, the ore alone may be introduced into the furnace, where it is to undergo the oxidising action of the air, after having been first broken up or divided. Or before submitting it to any treatment, or after partially roasting it, the ore may be mixed with suitable proportions of sulphuric acid, bisulphates, or sulphates, or carbon, and the whole is calcined whilst excluding the air, so as to accomplish, as the case may be, one or other of the following reactions:—

$$4\,SO^3 + MS = MO,\,SO^3 + 4\,SO^2.$$
$$^3(MO,SO^3) + MS = 4\,MO + 4\,SO^2.$$
$$^3(MO,SO^3) + {}^2MS = 5\,M + 5\,SO^2.$$
$$MO,SO^3 + C = M + SO^2 + CO^2$$

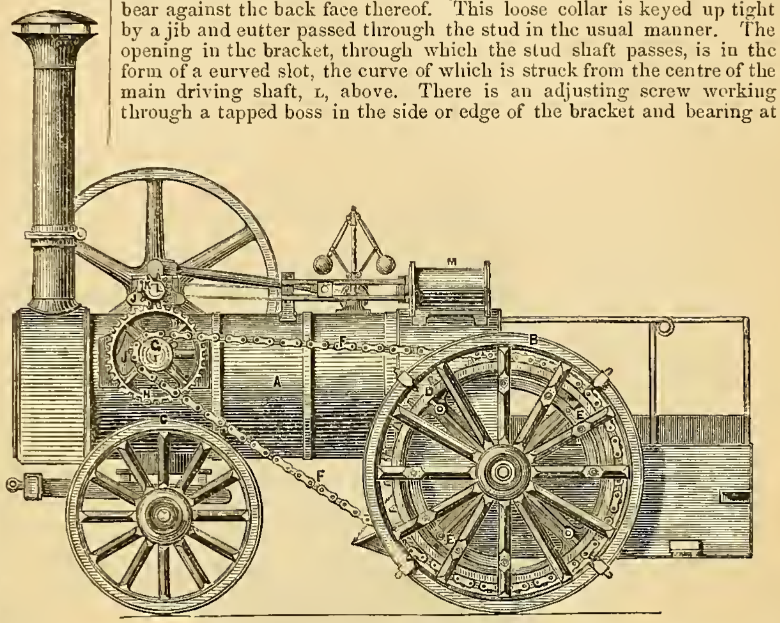
Any kind of exhaust and force pump, capable of resisting the action of the gases arising from combustion, and particularly the corrosive action of sulphurous acid, and which will not be injured in its working by the heat still retained by the gases for a short time after their leaving the furnace, will perfectly answer the objects to be effected in the calcining process, and in all processes for the oxidation of bodies. A pump having its essential parts constructed of cast-iron and vulcanized India-rubber will be found to answer the purpose well.

LOCOMOTIVE ENGINES.

Thomas Aveling, *Rochester—Patent dated September* 1, 1859

Mr. Aveling's improvements relate to certain arrangements of apparatus for giving more or less tension to an endless chain, or chains, when used for transmitting motion to the driving wheels of locomotives, whether for common roads, railways, or for agricultural purposes.

The subjoined figure represents a side elevation of a locomotive agricultural or farm engine, capable of being used also as a traction engine with one modification of the patentee's improvements applied thereto. A, is the boiler of the engine supported on the two pairs of running wheels, B and C. The hind axle has secured firmly to it a large notched chain wheel, D, round which is passed an endless driving chain, F, also passed round the small notched chain pulley, or peg wheel, G. This latter chain pulley has a long boss cast upon it, which boss turns freely on the stud shaft, G, and is secured to the spur wheel, H, on the same shaft by being inserted into the boss of that wheel and secured therein by keys, so that the spur wheel and chain wheel will turn together, but may be detached from each other when either of them becomes worn and requires renewing. The stud shaft, G, is provided with a large collar, I, which bears against the front face of the bracket, J, and a second but loose collar is applied behind the bracket so as to bear against the back face thereof. This loose collar is keyed up tight by a jib and cutter passed through the stud in the usual manner. The opening in the bracket, through which the stud shaft passes, is in the form of a curved slot, the curve of which is struck from the centre of the main driving shaft, L, above. There is an adjusting screw working through a tapped boss in the side or edge of the bracket and bearing at



its inner end against the side of the stud shaft. By turning this screw in the proper direction the stud shaft may be slid laterally in its curved slot.

The spur wheel, H, receives motion from the spur pinion, K, which slides laterally by means of a groove and feather on the end of the main driving shaft, L, but always revolves with that shaft. The object of this lateral adjustment of the pinion, K, is to throw it in or out of gear with the spur wheel, H, so that when the engine is not required to travel, the locomotive gear may be thrown out of action and the engine worked simply as an ordinary farm engine. The pinion, K, may be brought in or out of gear with the spur wheel, H, by sliding it along the main shaft and securing it in a proper position thereon by the set screw; or the same may be accomplished by a clutch lever, or other convenient contrivance. One side of the engine only is provided with gearing for driving the hind axle, and either one or both of the wheels may be driven from the axle by means of clutches or other suitable engaging and disengaging apparatus.

The running wheel is shown as being connected to the large chain pulley by means of a bolt passed through a segmental bar, E, secured to the arms of one of the main running wheels. By removing this bolt the running wheel will be disconnected from the large chain wheel. A suitable disconnecting apparatus is also applied to the opposite running wheel, so that either one or both wheels may be rotated or not as desired, which is a great advantage in turning sharp curves.

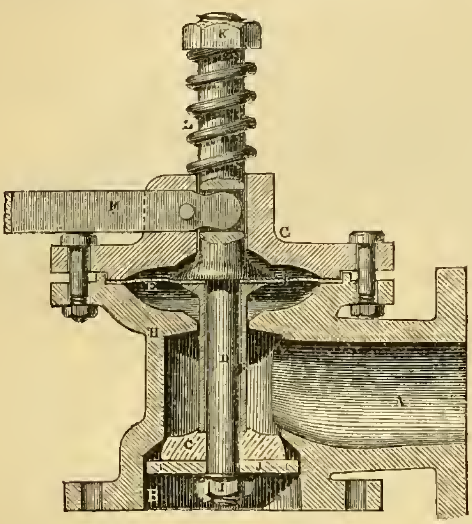
As the curved slots in the brackets, J, are struck from the centre of the main shaft, it follows that the stud shaft may be adjusted laterally to any desired amount, so as to tighten up the driving chain without interfering with the gearing together of the spur wheel, H, and pinion, K. M, is the steam-cylinder of the engine; and there is a water tank placed behind the fire box. The top plate or cover of this tank serves to carry the fuel, there being a raised side fitted round it for that purpose. This top plate answers also as a foot plate for the engine-driver. Projections are made of ┳-angle iron in the form of clips, which embrace the fellocs of the driving wheels, and are secured firmly in their places by nuts, or in any other convenient manner. These projections are intended to be used on soft ground, for the purpose of increasing the bite of the driving wheels, and they may be readily applied or removed at pleasure. By throwing the pinion, K, into or out of gear with the spur wheel, H, the engine may be used as a traction or locomotive engine, or as a stationary portable engine as required. The chain which the patentee prefers to use for the purpose of communicating the motion of the engine consists of an alternate pair of flat links and a single hollow link, the single link being of the full width of the opening between the flat links

VALVULAR APPARATUS.

J. H. Johnson, *London and Glasgow* (J. B. P. Gire, *Paris*).—*Patent dated September* 8, 1859.

These improvements in valvular apparatus consist in substituting for the ordinary stuffing-box a thin disc or diaphragm of metal or other suitable material, such as vulcanized India-rubber, gutta percha, leather, or horn, in combination with a helical spring, which disc is secured firmly at its edges, whilst its centre is perforated to allow of the passage therethrough of the spindle of the valve, which it is made to embrace tightly at any convenient and suitable part thereof. The elasticity of this disc or diaphragm and spring admits of the valve spindle rising and falling freely when closing and opening the valve. The helical or other spring is made to act directly or indirectly upon the valve spindle, for the purpose of keeping the valve closed.

The accompanying engraving represents in vertical section an example of a valve constructed according to this invention, as adapted for a



gas or compressed air cock, the gas entering by the lateral branch, A, and passing out by the tubular passage, B, or *vice versa*. The valve, C, is fitted on to a rod, D, provided with a suitable disc or diaphragm, E, the circumference of which is accurately secured in position by screwing up the part, G, against the body of the cock, H. A washer of caoutchouc may, if necessary, be placed on one or both sides of the diaphragm at its edges, for the purpose of rendering the junction perfectly tight. The rod or valve spindle, D, has a collar formed upon it, against the shoulder of which is fitted the diaphragm, E; this is firmly secured in its place by the tubular moveable collar, F. The valve is fitted to the upper end of the rod or spindle, D, and held, in conjunction with the guide piece, J, by the nut, I. The upper end of the valve spindle, D, also carries a nut, K, against which presses one end of the helical spring, I, the opposite end bearing against the part, G. This portion of the cock is provided with a lateral opening to allow of the passage of the end of the lever, M, which works on a pin fitted in the part, G, and enters an opening or slot formed in the rod or valve spindle, D, for the purpose of elevating it when required. A chamber is formed between the two parts, G and H, to allow of the free vertical play of the centre part of the diaphragm, E. This diaphragm when composed of metal should generally, whilst at rest, have a slightly concave or dished form, in lieu of being perfectly flat as shown. This concavity of the diaphragm in the example given would be on the surface next the valve. The figure represents the valve closed, but in order to allow of the escape or passage of the gas, it is necessary to raise the lever, M, which depresses the spindle, D, comprising at the same time the spring, L, and straightening the disc, E, if it were previously curved or convex, the valve being simultaneously depressed. The valve is guided in its movement by the piece, J, which slides against the interior of the cylindrical portion of the outlet passage, B, at the same time allowing a free passage for the gas. On releasing the lever, M, the expansion of the spring, L, virtually closes the valve. It is obvious that in lieu of a metal diaphragm or disc, a diaphragm of any other suitable material may be used, such, for example, as vulcanized India-rubber, gutta percha, leather, and horn, and in general, any diaphragm of sufficient thinness and elasticity to admit of its being bulged in either direction in the centre and returning to its original position again without its periphery being moved. If found desirable the disc may be bulged or curved before being inserted into its place, so as to enable it to give freely when subjected to a central pressure in either direction. The edge or circumference of the diaphragm should in all cases be held firmly and securely between two surfaces, either directly or through the intervention of rings or washers of leather, caoutchouc, or other suitable material.

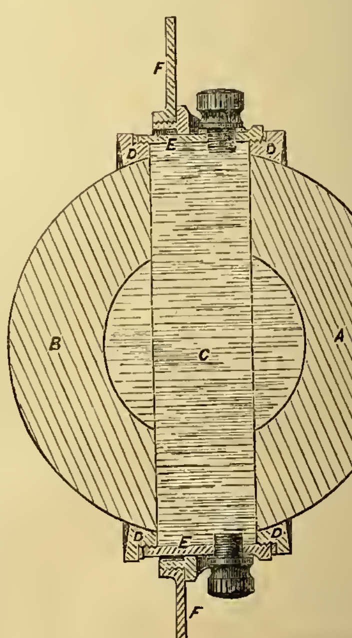
PHOTOGRAPHIC PANORAMIC LENS.

Thomas Sutton, *Jersey*.—*Patent dated September* 28, 1859.

The patentee of these improvements has long been distinguished for his ardent zeal in the pursuit of practical photography, as well as his literary labours in connection with "Photographic Notes," and his more recent literary venture the "Photographic Quarterly Review." Mr. Sutton has for a long time past devoted himself to the study of achromatic combinations, and sought to discover a combination which should produce pictures free from distortion, and capable of taking in a much wider field of view than those of the ordinary make.

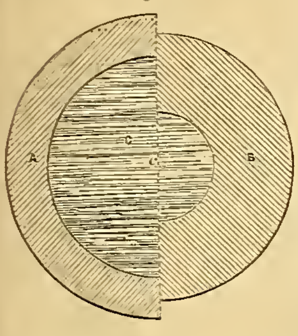
One arrangement of the patentee's compound lens is composed of two single thick concavo-convex lenses made of glass, the curved surfaces of which are portions of concentric spheres. They are secured to a suitable mount in such a manner and position that the curved surfaces of both of them (that is to say, all the four curved surfaces) are concentric, their common centre being a point in the axis of the compound lens, and the lenses having their concave surfaces opposite to each other. In the space or cavity between the concavo convex lenses is contained a transparent fluid of lower refractive and dispersive power than the glass of which the lenses are made. Water is a suitable and convenient fluid to employ. By giving proper radii to the surfaces of the lenses, the compound lens is rendered achromatic and convex so as to produce real images of objects. The two glass lenses may be made of the same kind of glass, and equal in all respects, but that is not a necessary condition. By using lenses made of different kinds of glass, and giving their concentric surfaces suitable radii, computed according to known principles of optics, the compound lens can be made achromatic and at the same time its spherical aberration can be reduced. The compound lens is provided with a central diaphragm having a central circular aperture of suitable size, in order to give sharp definition when objects at different distances from the lens are included in the view. This diaphragm is placed between the lenses, and within the fluid, in such a position that the centre of its circular aperture is at the common centre of the spherical surface of the lenses. In order to avoid the cost of using large glass concavo-convex lenses in large instruments, the patentee proposes to use in their stead, cases made of thin glass or other suitable material having the same curved surfaces as the solid glass lenses, and fitted with a transparent fluid of suitable refractive and dispersive power such as Canada balsam. The photographic pictures taken with these lenses should be produced upon tablets forming either a segment of a sphere or a segment of a cylinder, so placed in the camera as to have the same centre as the curved surfaces of the lenses.

Fig. 1.



The accompanying illustration, fig. 1, represents a vertical section of the simplest form of panoramic lens and mount, wherein the glass lenses, A, B, are both alike in all respects, and made of the same kind of glass. When this construction is adopted, and the internal cavity, C, is filled with water, the lens will work with sufficient accuracy for most practical purposes, if the following dimensions are employed, namely, if the lenses are both composed of the same light flint glass, their inner radii may be one half the length of their outer radii, if they be made of the same colourless crown or plate glass, their inner radii may be two fifths of their outer radii. Fig. 2 represents a sectional diagram of another form of panoramic lens constructed on the principle hereinbefore laid down, but composed of two concavo convex lenses, A and B, of different radii, the curves however being struck from one common centre, c, in the space between the two lenses, as is requisite in all lenses constructed according to this invention. The patentee does not confine himself to any particular form of mount, but the one shown in fig. 1 will be found to answer well in practice. According to this form of mount each lens is fitted into a metal ring, D, provided with an external screw thread for the purpose of screwing their fluid tight into the intermediate ring or zone, E, provided for that purpose with internal screw threads at each end. This zone, E, slides freely within the boss of the flange, F, by which the entire lens is secured to the woodwork of the camera, the sliding motion serving to facilitate the adjustment of the focus. The cavity, C, between the lenses, A B, is filled with water or other suitable fluid, the ring, E, being provided for that purpose with stoppered inlet and outlet apertures at G and H. When rigorous accuracy is desired either in the simple form of lens shown at fig. 1, or in the more complex one illustrated in fig. 2, wherein the lenses are of different radii and composed of different kinds of glass, the calculations for the radii must be based upon the data furnished by the ascertained refractive and dispersive powers of the glass, proceeding on the condition that the spherical aberration is to be reduced to a minimum, and if possible, three lines of the spectrum united in the focus. These calculations are made according to well known formulæ in optics, and involve no new principle, being such as every skilful optician is in the habit of making.

Fig. 2.

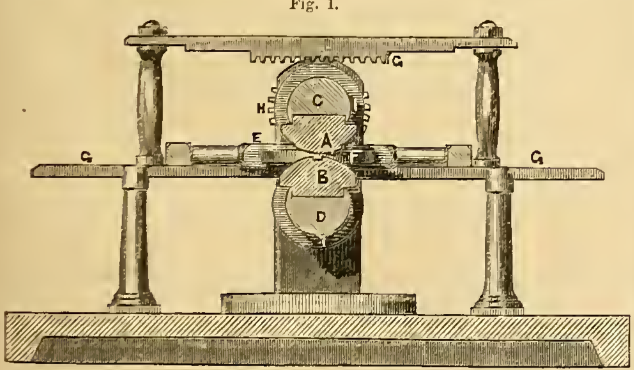


MOULDING OR SHAPING METALS.

J. H. Johnson, *London and Glasgow* (Levi Dodge, *U. S.*)—*Patent dated July* 8, 1859.

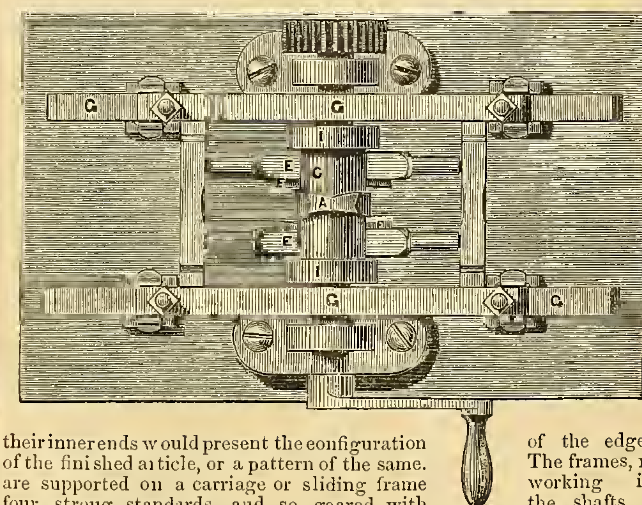
These improvements relate to the moulding or shaping articles in metal by means of dies or pressure shapers operating on several, or on all sides of the metal under treatment, at once, or simultaneously. This system of manufacture is applicable for the production of a great variety of metallic articles; but the machine we illustrate is for the manufacture of cutting axes or hatchets. Fig. 1 is a vertical section of the apparatus and fig. 2 is a plan of the same. In the manufacturing of these tools, a

Fig. 1.



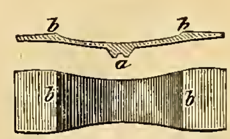
bar of iron is first passed between swaging dies, A and B, attached to partially rotatory shafts, C and D, arranged one above the other, carried in strong standards, and worked simultaneously by a winch handle on the one side, and connecting wheels on the other. This action shapes the bar into a thin differentially-curved piece (shown in section and plan at fig. 3), slightly thickened in the centre at *a* on the one side, and on the other side it is recessed also at the centre from *b* to *b*; and on the same side, where the two ends at *b*, it is again made thick, and bevelled off towards the two ends. This piece of metal is then hammered, folded up, and welded, so that the thickened central portion, *a*, forms the head of the axe. The space, or hollow portion formed between the commencement of the thickened bevelled portion, *b*, forms the eye of the axe; and the two thick portions, *b*, at the beginning of the bevels, when welded, form the bit of the axe to which the actual edge cutting piece of steel is to be welded. After the bar comes from the swage dies, it is forged by the trip hammer into the required shape, as it has hitherto been found impracticable to operate upon more than two sides by means of dies. Now, in the present invention, a great saving is effected by causing the dies to shape the edges of the bar to the required form at one operation, and prior, of course, to the folding of the bar. In doing this, two side frames, E, are prepared, set up, one on each side of the swaging dies; and into these are inserted suitable dies, F, of various lengths, easily moveable back and forward. The lengths of these dies vary according to the shape to be given to the axe "poll," or other article to be formed, so that, if the outer ends of the dies be bevelled,

Fig. 2.



their inner ends would present the configuration of the edges of the finished article, or a pattern of the same. The frames, E, are supported on a carriage or sliding frame working in four strong standards, and so geared with the shafts, C and D, driving the swage dies, as to move in conjunction with these dies, by the well known contrivance of a double rack, G, and segmental wheels, H. Upon the shafts, C and D, are strong flanges, against the shoulders of which, the back ends of the dies pass, as the frames move between these shoulders, thus keeping the moveable dies, F, up to their work as the bar of iron or metal passes between them. These dies are so arranged as to come into action immediately at the point or line of greatest pressure upon the metal by the swaging dies, A and B, or so little in advance of that line, that, for all practical purposes, their action is considered as simultaneous; and according to the projection of the moveable dies, will be the lateral impression upon the metal, and this impression is retained by the continued pressure of the dies as far as necessary; so that all sides of the axe are operated upon at the same time, and any required configuration is given to it by the operation of the moveable dies, F, in conjunction with the swage dies, A and B. In this arrangement, the dies have a reciprocating motion, as operating only upon a short piece of metal; but they may be arranged so as to repeat the operation, by continuous rotation or motion upon a long piece or bar of metal for forming these and various kinds of articles; and it is not necessary to the result or their operation that these dies should be operated by the flanges, I, hereinbefore mentioned, as various well-known mechanical means may be substituted therefor without changing their operation. A succession of moveable dies may not be necessary to the successful application of this principle of operation, and, single moveable dies of appropriate shape, may, in some cases, be sufficient for the purpose—preserving the essential characteristics of the invention, namely, the mode of operating by dies on several or all sides of the piece of metal at once, so as to complete the forms of variously shaped articles by simultaneous die pressure on several or all sides, thereby dispensing with after forging or other means of working into shape.

Fig. 3.

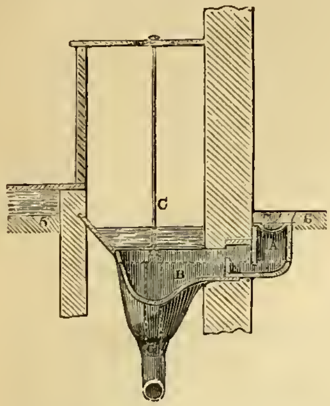


SANATORY WATER CLOSET.

Thomas Lister, *Derbyshire.—Patent dated August* 4, 1859.

These three improvements are designed to meet a want long experienced by local boards of health, architects, and householders, of a cheap and efficient water closet, as a substitute for common privies.

Fig. 1.



The general arrangement of the closet is shown in the annexed engravings, but is subject to such modification as to suit any peculiarity in the position or form of existing premises, with regard to supply and discharge. Fig. 1 is a vertical section taken along the line, 1 2, fig. 3; fig. 2 is a vertical section, corresponding to, and at right angles to fig. 1, and taken along the line, 3 4, fig. 3; fig. 3 is a horizontal section, taken along the surface line, 5 6, fig 1.

The only water required for the purpose of cleansing is the waste from a pump or tank, or the surface water, which is conveyed by the surface channel or pipe, through the trap, A, into the vault, B, where it rises to the height shown by the dotted line, at which height it is retained for the purpose of flushing, the surplus water passing off through an aperture in the plug, C, which is tapped to prevent any foul air escaping from the sewer or drain. It is then only necessary, to raise occasionally the plug when the contents of the vault are flushed into the sewer.

The "sanatory privy vault" can be applied to any ordinary privy, or range of privies, at a very small outlay; and, from the simplicity of arrangement and construction, and the nature of the material employed

Fig. 2.

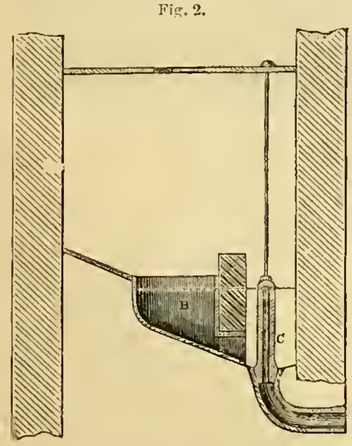
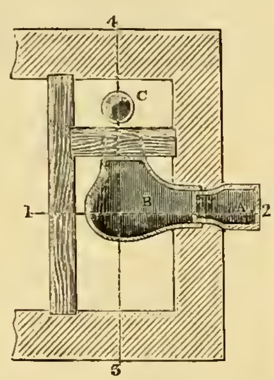


Fig. 3.



it is not liable to damage or disarrangement; consequently, after the first cost, no further expense is entailed. The whole of the materials employed are of glazed earthenware.

For cottage property in country towns and villages, the soil may be disposed of by flushing into the sewer, or retained in a covered tank or well, for future application, as manure for garden or farm purposes

MANUFACTURE OF FISHING NETS.

John and William Stuart, *Musselburgh.—Patent dated August* 12, 1859.

Messrs. J. and W. Stuart, whose highly ingenious and beautiful machinery for making fishing nets we fully illustrated and described in our *Journal* for April last, have introduced some further improvements in the manufacture of nets. The patentees' present invention consists in the adoption or adaptation, and use of any single yarn fibre in the manufacture of nets by machinery. By the adoption of single yarn for this purpose, nets can be produced at a much cheaper rate than has hitherto been the case, whilst, the fabric is softer and more pliable, better to handle in use, and a more successful fishing net. It also takes on the "tannin," or matter which operates to preserve the net in a superior manner. The single yarn, after being prepared and singed in the ordinary manner, is manufactured into fishing nets by means of the machinery or apparatus referred to in the hereinbefore in part recited letters patent, or by means of other machinery or apparatus in ordinary use. The manufactured nets are afterwards immersed in a solution of bark, or other astringent matters containing tannin, this is done for the purpose of preserving the nets, and enabling them to withstand the action of sea water. In this way, nets peculiarly well adapted for fishing purposes, may be produced at much cheaper rates than heretofore, having, at the same time, the advantage of being more manageable in use than those made from the ordinary yarns, which are much thicker and harder when made up.

EXTRACTING SEEDS FROM FRUIT.

J. A. Clarke, *Lincoln.—Patent dated November* 7, 1859.

Mr. Clarke has, under these letters patent, introduced a useful domestic appliance which is intended to do away with the ordinary tedious and uncleanly mode of stoning or depriving raisins of their seeds. Every one who has partaken of plum pudding is aware of the very unpleasant effect of meeting with a stray seed in his portion; and the poor cook is at once accused of flagrant carelessness. Mr. Clarke's scissor-like instrument is designed to do the work in a quick and cleanly manner.

The subjoined illustration represents a perspective view of the raisin stoner. Two levers, A, are provided with suitable apertures for the insertion of the finger and thumb, and connected together by a pin joint at B. Each of these levers has a pressing surface, or plate, C, formed upon it; and they are provided respectively at the front extremities, the one with a punch, D, and the other with a corresponding hole, or aperture, E. The fruit to be operated upon by this instrument is first flattened between the pressing plates, C, by using the instrument after the manner of a pair of scissors, after which the seeds, or stones, are cut or forced out by placing the fruit under the punch, D, and over the hole, E, and causing the punch to descend and pass through the fruit, at the same time expelling the seed, or seeds, contained therein.

LAW REPORTS OF PATENT CASES.

Capsules.—Betts *v.* Menzies.—A full report of this case is given in our *Journal* for July, 1859, p. 100.

This case has been long standing over for judgment. The jury found a verdict for the plaintiff, but upon application to the Court of Queen's Bench, that verdict was set aside, and the verdict entered for the defendant. From this there was an appeal to the Court of Error, and the case was argued some time since, and judgment was postponed.

Mr. Baron Martin said this was an appeal from the unanimous judgment of the Court of Queen's Bench. He read a judgment in which the Chief Baron, Mr. Baron Channell, and himself concurred in affirming the judgment of the Court below; but there was a difference of opinion. The result, however, was, that five judges were for affirming the judgment, and two for reversing it, and therefore the judgment would be affirmed.

Mr. Justice Keating read the judgment of himself and Baron Bramwell in favour of affirming the judgment.

Mr. Justice Williams delivered the judgment of himself and Mr. Justice Willes, in which they thought the judgment ought to be reversed.

Judgment affirmed.

Betts *v.* Menzies.—Before Vice-Chancellor Sir Page Wood, 9th June, 1860. Having obtained a copy of the short-hand writer's notes of Vice-Chancellor Sir Page Wood's judgment on the motion to dissolve the injunction, we are able to give a fuller report of it than the short account given above. The question before the Court was, as to the justice of dissolving an injunction to restrain the defendant from manufacturing an article—namely, thin sheets of lead and tin united by pressure—covered by the plaintiff's patent, before the plaintiff's appeal from the decision of the Court of Queen's Bench had been heard. It will be remembered, that at the first trial the plaintiff obtained a verdict; that the verdict was set aside on the ground of misdirection on the part of the judge (Lord Campbell); that the plaintiff again obtained a verdict at the second trial; and that the Court of Queen's Bench had ordered that verdict to be set aside and a verdict to be entered for the defendant. From this decision the plaintiff had appealed. The defendant applied to the Court of Chancery to free him from the injunction, on the ground of the decision in the Common Law Court. The attention of the Court of Queen's Bench had been directed to a patent taken out by one Dobbs, forty-five years before Mr. Betts had obtained his; and although the evidence was contradictory as to what Dobb's patent was really worth, the Court had decided that Mr. Betts' invention had been deprived of its novelty by reason of the substantial identity of the two. Finding, however, that the plaintiff had made a complete and independent discovery of great practical utility, and that he had enjoyed that discovery without disturbance for some time; and seeing the mode in which the defendant had first introduced himself to the business—namely, during the course of a treaty for a license to work it—the Vice-Chancellor came to the conclusion that he should do right to refuse the application, under the particular circumstances of the case, until the appeal had been decided. It is clear, from the observations that fell from the Vice-Chancellor, that he was not satisfied with the order of the Court of Queen's Bench; and he remarked on the doubt with which some of them had come to the conclusion that Mr. Betts' patent was bad, and on the mistaken view that had been taken of his specification. On the point as to the proportions in which the two metals were to be blended, Lord Campbell, it appears, had said that Mr. Betts had mentioned no definite proportions, but claimed by implication the union of the two metals in all proportions; whereas the fact was, that he had mentioned definite proportions—namely, the lead was to be united with a twentieth of tin in thickness.

Betts *v.* Menzies.—Before Vice-Chancellor Sir Page Wood, 18th July, 1860. • Since the refusal of the Vice-Chancellor to dissolve the injunction on the 9th of June, the Court of Exchequer Chamber, by a majority of nine out of twelve judges, had decided that the plaintiff's patent was invalid. The defendant, accordingly, moved the Court again to dissolve the injunction, which was opposed by the plaintiff on the ground that he was about to appeal to the House of Lords. The Vice-Chancellor said that no precedent could be shown for retaining the injunction pending the appeal, which might not be decided for a year or two. He should, therefore, dissolve the injunction, the costs of that application and of the former motion to dissolve being made costs in the cause, and the defendant, in the meantime, keeping an account of what he sold in England.

Gas.—Hills, *v.* The London Gaslight Company.—This was a resumption of the suit in the Vice-Chancellor's Court, before Sir W. P. Wood, which we have reported from time to time. The action was brought to restrain the defendants from the infringement of the letters patent granted to the plaintiff, and bearing date the 25th of November, 1849. The validity of the plaintiff's letters patent has been established at law against the defendants, subject to an appeal now pending to the Court of Exchequer Chamber, under the Common Law Procedure Act of 1854. The present suit came on before Vice-Chancellor Wood on the 6th of June last, upon a motion for an injunction, a report of which was given in our last publication, p. 95 Upon that occasion, the defendants alleged that the process of gas purification then in use by them at their works was not an infringement of the plaintiff's letters patent, but was a process patented by Mr. Frederick John Evans, under letters patent, dated the 27th of August, 1858, for an improvement applicable to gas purifying. Upon this, the Vice-Chancellor put the defendants under an undertaking, and gave Mr. Hills leave to renew the motion, upon the ground that Mr. Evans' process, and the process actually in use by the defendants' company, were an infringement of Mr. Hills' letters patent. The case now came on upon the renewed motion. It appeared that Mr. Evans, in his specification—after stating that it was then the general practice to employ some preparation, or natural compound of oxide of iron, for the removal of the impurity known as sulphuretted hydrogen, and that these oxides had usually been obtained either from natural sources in the form of ochres or natural oxides, or from the decomposition of the sulphates or other salts of iron; but that all ochres or natural or native oxides were mixed with earthy matters, which, having no affinity for the impurities contained in gas, were inert and useless ingredients; and that the oxides obtained by the decomposition of the sulphates or other salts of iron were purer, but much more costly to obtain; and, although they admitted of being frequently revivified, yet their use formed a heavy annual item of expense—also stated that the object of his invention was to obtain a material which would be energetic in its action, easy of production, and inexpensive. To this end he took turnings, borings, and filings of iron, or scraps or small pieces of iron in the form of shot, and exposed them to gases or liquids, whether at ordinary or elevated temperatures, such as would insure their rapid oxidation. This process, upon the explanation of the defendants' witnesses, was understood to mean the exposure of the small pieces of iron to the action of air and water, producing hydrated oxide of iron. The question was, whether the product was a precipitated or hydrated oxide of iron, the use of which was claimed by the plaintiff under his letters patent.

Mr. Rolt, Q.C., Mr. Grove, Q.C. (of the common law bar), and Mr. Marten appeared for the plaintiff; Sir Hugh Cairns, Q.C., the Hon. George Denman (of the common law bar), and Mr. Druce, appeared for the defendants

The Vice-Chancellor, without calling for a reply, said that the plaintiff was clearly entitled to an injunction. There was substantially no conflict of evidence. Assuming that, as the defendants contended, the strict technical meaning of "precipitated" was restricted to the action of throwing down a substance from a state of solution, still it was clear that the term was used, even at the present day, in a larger sense, and was a convenient term of distinction in the sense in which it was used by the plaintiff in his specification. Without wishing to disparage Mr. Evans' process, it appeared to be a process for making rust in the way in which it was ordinarily made. But whether this was so or not, the substance made was a member of the class the use of which was claimed by Mr. Hills, and therefore its use by the defendants was an infringement of Mr. Hills' letters patent. The case was so clear that there appeared to be no question for trial at law. The order would be as follows:—The Court declaring that the process in use by the defendants and the purification of gas by the material described in Mr. Evans' letters patent is an infringement of Mr. Hills' letters patent, and the plaintiff undertaking to abide by any order of the Court as to damages, award an injunction in the terms of the prayer of the bill.

It was then arranged, with the consent of the plaintiff, that the injunction should take effect in six week's time, the interval being allowed to enable the defendants to make the necessary changes in their works, and the defendants keeping an account in the meantime.

Purifying Water: De Normanby *v.* Winchester.—In this suit, which was instituted for the purpose of restraining the defendants from an alleged infringement of a patent for purifying water by distillation and aëration, combined with the use of animal charcoal, the defendants had, upon the motion for an injunction, entered into an undertaking to give the plaintiffs notice of their making or selling any of the machines complained of, so as to afford an opportunity of inspection to the plaintiffs. It was then understood that the plaintiffs would bring an action to try their right. Two months having elapsed since the undertaking was given, and the plaintiffs not having brought their action, the defendants now moved that they might be discharged from their undertaking.

For the plaintiffs, in opposition to the motion, it was contended that there had been no opportunity of determining the question of bringing an action, as it appeared upon the evidence that no machine of the nature complained of had been made since the undertaking was given.

Mr. Rolt, Sir H. Cairns, Mr. Cotton, and Mr. Baggallay appeared for the parties.

His honour thought that no sufficient ground had been shown for continuing the undertaking. The Court was, in truth, asked by the plaintiffs to interfere with the defendants' trade for an indefinite period. The motion would therefore be granted.

Caps and Bonnet Fronts: Morrison *v.* Whitehall.—This was an action in the Court of Exchequer, before the Lord Chief Baron. The action was brought for infringing a patent for a certain apparatus for making ladies' caps and bonnet fronts of pieces of blond fixed upon bands. The model of the machine, which produces this light and elegant work, bears so strong a resemblance to a guillotine, that a view of it is not calculated to fill forcigners with delight.

The Solicitor-General and Mr. Hindmarch were council for the plaintiff; Mr. Bovill, Q.C., and Mr. Webster appeared for the defendant.

The case was only partly heard.

REVIEWS OF NEW BOOKS.

The Year-Book of Facts in Science and Art; Exhibiting the most important Discoveries and Improvements during the past year. Fcap. 8vo. Pp. 288. Frontispiece and Vignette. London; W. Kent & Co. 1860.

Casting our thoughts back some 20 years we think of the predecessor of this book, "The Arcana of Science," and of the long and successful run it had. Then came the "Book of Facts," recording in a small and handy compass the scientific work of the past year, which enables us to look back and take in at a glance as it were the progress we have made. And so year by year it has made its appearance until Mr. Timbs' name has become a household word to all who are interested in scientific intelligence. When the hand of this industrious compiler shall no longer wield the pen, who will weave into the form of a well-ordered design the many scientific facts which are scattered far and wide, and need constant attention to keep together. May his mantle fall upon a worthy successor, whose labour like that of Mr. Timbs may be one of love! The present volume presents a rich and varied store of information, and affords satisfactory evidence that there is no diminution in the zeal with which scientific pursuits are followed out. The numerous articles and items of information are arranged under distinct heads, for example, Mechanical and Useful Arts, Natural Philosophy, Electrical Science, Chemical Science, and so on. So that any subject may be readily referred to under its distinctive head, or the whole annual addition to our information in a particular branch may be as easily scanned over. We extract the account of the great steam frigate *Warrior* now building at Blackwall.

"The contract for the first of the tremendous engines of war to bear this name was accepted in the spring of 1859, by the Thames Iron Shipbuilding Company, and the first vessel is now building at Blackwall This was originally intended for an iron-cased steam ram; that is to say, a vessel built as nearly shot proof as possible, and not only intended to engage, but especially to run into and sink others. From this design, however, she has been altered, and is now to be built merely as a shot-proof heavy-armed frigate of perhaps 36, or perhaps 70 guns, as the Admiralty may eventually decide. She is to be named the *Warrior*, and will be at once fire and shot proof—the largest, strongest, swiftest man-of-war afloat in the world. But since the drawings of this noble ship were made, the Admiralty have, in their more recent plans for genuine steam rams, accepted much which they had formerly condemned, and, on the other hand, condemned a good deal of work on which they formerly insisted. Thus the two iron-cased vessels, or steam-rams proper, which are now being built,—one on the Tyne by Palmer, and the other by Westwood and Bailey at Millwall,—are, though both shot proof, smaller in tonnage and armament, and nearly 100 feet shorter, than this gigantic frigate, the *Warrior*. Though great progress has been made with it, the more striking parts of the hull, such as the beak and stern, have yet to be built up. Now (Jan. 1860) one only sees dimly through the forest of timber which supports the midship part of the ponderous hull, the really enormous solidity with which it is all put together. A perfect network of T-shaped iron beams cross and re-cross one another in every direction. The wrought-iron "box-girders" which run throughout the vessel from stem to stern are the most powerful things of their kind that have ever yet been made; yet all these beams and girders, angle-irons, and tie-rods, of which the whole hull is apparently built, are mere trifles to the things which have yet to be put into her. A whole mountain of teak, which half fills one part of the yard, has to be consumed in her outer 'lining,' while her armour plates lie about in ponderous slabs, weighing many tons, each from 16 to 18 feet long, 4 feet wide, and 4½ inches thick. The nose, or cutwater of the vessel is one immense slab of wrought-iron, about 30 feet long, 10 inches thick, and weighing upwards of 17 tons. The screw frame is one piece of the finest forged iron, without the slightest flaw of any kind and weighing no less than 44 tons. Till the present work was commenced such masses of forgings were never thought of, even in the construction of the *Great Eastern* itself.

The following are the dimensions of the *Warrior*:—

Extreme length, 380 feet; ditto breadth, 58 feet; depth, 41 feet 6 inches; and her tonnage no less than 6177 tons. The engines (screw, of course) are to be by Penn & Sons, of 1250 horse-power, and of these we shall, on a future occasion, lay a separate and detailed description before our readers. Their total weight, with boilers, will be 950 tons. For these she will, unfortunately, only be able to carry 950 tons of coal, or enough for about six days' steaming. The armament, (counting her only as a 36-gun frigate), with masts and stores, will weigh 1200 tons, and this, with the hull, which is to be no less than 5700 tons, will give her a total weight, when ready for sea, of about 9000 tons in all, or the weight of the *Great Eastern* when launching. With the fine lines and immense horse-power of the *Warrior* a speed of not much less than 15 or 16 knots an hour is anticipated; so that should her commander, in case of any emergency, choose to use her as a steam-ram, he could literally drive his ship straight over a whole fleet of three-deckers, without a chance of being injured by their broadsides in closing.

There is no external keel, but an inner kind of girder, which acts as a keelson. This is formed of immense slabs of wrought scrap iron an inch and a quarter thick, and 3 feet 6 inches deep. To it are bolted the ribs—massive wrought iron T-shaped beams an inch thick, and made in joints 5 feet long by 2 deep up to 5 feet below their water-line, where the depth is diminished so as to form a deep ledge or angle, on which the armour plates and their teak lining rest. These immense ribs, except where the port-holes intervene are actually only 22 inches apart. Above the keelson, and inside the ribs, are the five box-girders we have already mentioned, which go the whole length of the ship, from stem to stern, and from which spring diagonal bands, tying every rib together. The orlop deck is of wood, and 24 feet above the keel; the main deck is of iron, and cased with wood, and nine feet above the orlop; the upper deck will also be of wrought iron, cased with wood, and seven feet nine inches above the main. All these decks are carried on wrought iron beams of the most powerful description, to which both decks and ribs and all are bolted as in one piece. The 'skin' of the ship, as it is termed, which covers all these ribs on the outside, is also of wrought iron, an inch and a quarter thick, under the bottom to nearly one inch thick up to the spar deck. From five feet below the water line up to the upper deck comes, in addition to this, the great armour of teak and iron over all. This is formed of a double casing of the hardest teak, 18 inches thick, with the beams laid at right-angles to one another. Over these again come the plates of iron we have already mentioned, so as in all to case the broadside of the vessel with 20 inches of solid teak and 5 inches of the very finest wrought iron. This tremendous coat of armour, however, is, of course, not intended to cover the whole of the vessel. Indeed, with such an entire casing it could scarcely float at all. Only the broadside, or about 220 feet of the whole length is so protected. The stem and stern have no armour plates, but are covered with iron plates 1½ inch thick, and lined with 24 inches of teak. To compensate for the armour, both the stem and stern are crossed and re-crossed in every direction with water-tight compartments, so that it is almost a matter of perfect indifference to those on board the *Warrior* in action whether they get riddled with shot or not. It is, of course, needless to say that the whole vessel is subdivided in some 20 places by wrought-iron water-tight bulkheads of the most solid description. Those which cut off the stem and stern from the armour-coated portion of the ship are cased with teak and armour plates below the water-line, exactly like the broadside of the vessel Thus, supposing it possible that both stem and stern could be shot away completely, the fighting portion of the vessel would remain as complete and as impenetrable as ever, still opposing 20 inches of teak with 5 inches of wrought iron to every shot. The bows, as the spot where the whole force of the shock must be received in case of the vessel ever being used to run down an enemy's ships of war, are strengthened inside with a perfect web of ironwork. No less than eight wrought-iron decks, an inch thick, stretch back from this part to the armour plates as well as supports and diagonal bracings innumerable. The number of guns to be carried on the main deck is to be 36, of which 30 are under the armour coating, and the rest fore and aft. It is not yet positively decided, though we believe there is little doubt that there will be either 30 or 36 broadside guns on the upper or spar deck as well, making her a 60 or 70-gun frigate. All these pieces of ordnance are to be Armstrong's longest range guns, and throwing shot of 100 lb. weight.

All the armour plates are dovetailed at the edges into one another, and fastened through the teak and iron into the inner ribs of the ship with bolts, which are counter-sunk outside so as to have their heads level with the surface of the plate. The total weight of the plates required for the vessel is 1000 tons.

These monstrous slabs of armour are formed of scrap-iron with a certain proportion of puddled bar-iron, which makes a mixture of almost unyielding toughness. Some of them taken to Portsmouth have been subjected to the most severe tests in order to ascertain their capacity for resisting shot and shell, and the remnants of these plates are now at the works at Blackwall. They were fired at by 68-pounders at a point blank range of 200 yards. The massive shot even at this short distance have failed to penetrate the iron, though they have dinted it to the depth of one and a half or in some cases two inches. Six of the shots struck within a circle of almost less than two feet diameter. Each after the second shot (which, of course, more or less broke the fibre of the iron) tore a narrow circular fissure or crack outside the mark of the diameter of the shot dint, until at the sixth shot in almost the same place the plate was broken and torn apart. Six such heavy shots are never likely to strike all in the same spot; and the *Warrior* will herself be armed with the heaviest guns in the world, which have sufficient range to enable her to commence her action with an enemy at least four miles distant. At two miles she herself will be to the enemy out of range for all practical purposes, even for the heaviest smooth-bore guns yet used in any navy, and at 1000 yards distance a 68-pounder shot scarcely dints her iron sides to the depth of half-an-inch."

Ure's Dictionary of Arts, Manufactures, and Mines. New Edition, chiefly re-Written and greatly Enlarged. Edited by Robert Hunt, Keeper of Mining Records. London: Longman & Co. 1860.

Part IX. of the new edition of this valuable work is now before us. It contains the conclusion of the article iron, and papers on ivory, the Jacquard loom, the lace manufacture, lamps, lead, leather, (including tanning and currying,) lighthouse, linen, lithography, locks, and lucifer matches, besides various minor articles. As far as we have examined, it seems carefully brought down to the present time, and we have no hesitation in saying that the work is indispensable to all connected with arts, manufactures, or mines. In these times, when everybody is expected to know something about everything, or to forfeit the character of being a well informed man, this book should be in all libraries ready at hand to impart its condensed stores of knowledge on all subjects with which the greatness of the nation is so intimately concerned.

Aide-Mémoire to the Military Sciences. Framed from contributions of Officers and Others connected with the different Services. Second Edition, revised and enlarged, with numerous Plates and Woodcuts. London: Lockwood & Co. 1860.

The second part of the second volume is now on our table. The principal articles are meteorology, military mining, mountain barometry, muskets and musketry, astronomical observatory, magnetical observatory, and ordnance. The work is brimfull of information for the scientific branches of the military profession; and when Government shall insist that all who seek for commissions in our army are properly qualified to serve their country, it will be necessary for our "captains, and colonels, and knights at arms," to consult it more frequently than they now do. All officers who have heads and know how to use them, are well acquainted with the book, and civilians may often advantageously refer to it for valuable information.

CORRESPONDENCE.

HOISTING MACHINERY FOR MINES.

The pages of your *Journal* bear witness that you have at all times taken a warm and most praiseworthy interest in the subject of safety machinery and appliances for mines. Permit me, as a colliery viewer and one who has had a long experience in these matters, to direct your attention to my improvements in applying power to, and in machinery for, raising and lowering coal and other articles from and into mines.

Fig. 1.

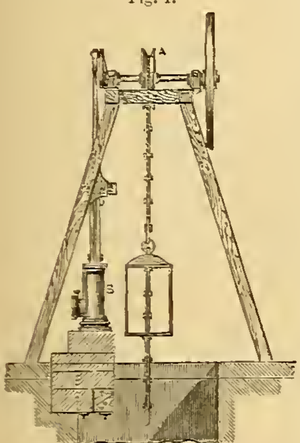


Fig. 1 represents an elevation of a pit head, showing my mode of working the cages of a mine. A is a drum keyed on the crank shaft of the steam engine, B. This drum is made with recesses for the notches of the rope to take into. The rope is taken over guide pulleys and supported above the mouth of the pit, and to each end of the rope is attached one of the cages. One of the cages is shown up, and the other is supposed to be at the bottom of the pit; when the engine is put in motion one of the cages ascends while the other descends. By this means a great saving is effected in the rope, as very little more than half the usual length is required. There is also less wear and tear, as the rope never overlaps; and no slipping can take place, owing to the notches, which are riveted to the rope, taking into the recesses of the drum, A. The foundation of the steam engine is placed close to, or partly over, the mouth of the pit, and the connecting rod reaches from the cross-head of the piston-rod to the crank shaft. The object of thus applying the steam engine is to dispense with the guide pulleys usually employed for guiding the rope or chain from the steam engine to the mouth of the pit. Fig. 2 represents

Fig. 2.

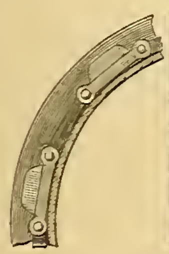


Fig. 3.

Fig. 4.

Fig. 5.

part of a drum with cogs, and of my improved chain, which may be advantageously used instead of the cords, chains, or bands usually employed; and fig. 3 is a side view of the said chain. The open links of the chain take on the cogs of the drum, consequently no slipping can take place when this chain is employed for raising and lowering the cages into the pit. Fig. 4 represents two views of a flat wire rope, to which pieces of wrought iron, forming notches, are riveted at suitable distances apart, as shown in fig. 1. Fig. 5 is another modification of my improved flat wire rope. The advantages of the improvements are so obvious to persons conversant with the usual modes of working mines that further details would be superfluous.

R. Walker.

Eccleston, near Prescot, July, 1860.

LUNAR MOTION.

It has been a subject of discussion of late, whether the moon has a motion so as to form an axis within itself. I think this may be easily shown by a very simple experiment. Take a magnetic compass, a card, and a pin; place the pin in the centre of the card, the compass at its edge; the pin representing the earth, the compass, the moon. Make the card revolve on and with the pin in any ratio you please. Looking from the pin to the compass, it will apparently revolve on an axis within itself, as it will present every part of its edge in succession as it revolves round the pin; but it does not really do so, as its polar attraction prevents it from turning; for we may lay it down as an axiom, that every fixed particle of a body revolving will present only one side to its nearest axis, and change all its sides to everything beyond that particle that has not the same motion.

Instead of the pin, a magnet is placed, so as to attract one end of the needle of the compass, which will show the true condition of the earth and moon. The card with the compass on it represents the moon; and the magnet, in any ratio the nearest axis of the needle, will be the magnet representing the earth. Therefore the moon has not a motion that will produce an axis within itself, the earth being its nearest axis.

Edinburgh, July, 1860. Jonathan Davidson.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

THE BRITISH ASSOCIATION AT OXFORD, 1860.

This year's meeting took place much earlier than usual, for the 27th of June was the day of assembling. After Prince Albert had resigned the chair to Lord Wrottesley, the President of the year, came the presidential address, the first part of which referred to the progress of Oxford in the recognition of science, and the steps which have been there taken of late with reference to alterations in the old scheme of education. The President then took up the topic of astronomy.

At the beginning of the year 1820, when the Astronomical Society was founded, the private observatories in this country were very few in number. The establishment of that society gave a most remarkable stimulus to the cultivation of the science which it was intended to promote. I can give no better proof of this than the fact that the *Nautical Almanac* now contains a list of no less than twelve private observatories in the United Kingdom, at nearly all of which some good work has been done; add in addition to this, some observatories, which have been since discontinued, have performed most important services—I may instance that of the two Herschels at Slough, and that of Admiral Smyth at Bedford.

It may not be uninteresting if I describe the nature and utility of some of the results which these several establishments have furnished to the world: I say the *world* advisedly, for scientific facts are the common inheritance of all mankind.

But first a word as to the peculiar province of the observatories which are properly called "public," such as the far-famed institution at Greenwich. Their task is now more peculiarly to establish, with the last degree of accuracy the places of the principal heavenly bodies of our own system, and of the brighter or fundamental fixed stars, which are about 100 in number. But in the early stages of astronomy, we were necessarily indebted to public observatories for all the data of the science. On the other hand, their voluntary rivals occupy that portion of the great astronomical field which is untilled by the professional observer, roving over it according to their own free will and pleasure, and cultivating with industrious hand such plants as the more continuous and severe labours of the public astronomer leave no time or opportunity to bring to maturity.

The observations of our private observers have been chiefly devoted to seven important objects:—

First. The observing and mapping of the smaller stars, under which term I include all those which do not form the peculiar province of the public observer.

Secondly. The observations of the positions and distances of double stars.

Thirdly. Observations, delineations, and catalogues of the nebulæ.

Fourthly. Observations of the minor planets.

Fifthly. Cometary observations.

Sixtly. Observations of the solar spots, and other phenomena on the sun's disc.

Seventhly. Occultations of stars by the moon, eclipses of the heavenly bodies, and other occasional extra-meridional observations.

And first as to cataloguing and mapping the smaller stars. This means, as you know, the accurate determination by astronomical observation of the places of those objects, as referred to certain assumed fixed points in the heavens. The first star catalogue worthy to be so called, is that which goes by the name of Flamsteed's, or the British Catalogue. It contains above 3,000 stars, and is the produce of the labours of the first Astronomer Royal of Greenwich—labours prosecuted under circumstances of great difficulty, and the results of which were not given to the world in a complete form till many years had elasped from the time the observations were made, which was during the latter half of the seventeenth century. About the middle of the eighteenth century, the celebrated Dr. Bradley, who also filled the post of Astronomer Royal, observed an almost equally extensive catalogue of stars, and the beginning of the nineteenth century gave birth to that of Piazzi, of Palermo. These three are the most celebrated of what may be now termed the ancient catalogues. About the year 1830, the attention of modern astronomers was more particularly directed to the expediency of re-observing the stars in these three catalogues—a task which was much facilitated by the publication of a very valuable work of the Astronomical Society, which rendered the calculations of the observations to be made comparatively easy, and, accordingly, observations were commenced and completed in several public and private observatories, from which some curious results were deduced; as, *e.g.*, sundry stars were found to be missing, and others to have what is called *proper motion.* And now a word as to the utility of this course of observation. It is well observed by Sir John Herschel, "that the stars are the landmarks of the universe; every well-determined star is a point of departure which can never deceive the astronomer, geographer, navigator, or surveyor." We must have these fixed points in order to refer to them all the observations of the wandering heavenly bodies, the planets, and the comets. By these fixed marks we determine the situation of places on the earth's surface, and of ships on the ocean. When the places of the stars have been registered, celestial charts are constructed; and by comparing these with the heavens, we at once discover whether any new body be present in the particular locality under observation; and thus have most of the fifty-seven small or minor planets between Mars and Jupiter been discovered. The observations, however, of these smaller stars, and the registry of their places in catalogues, and the comparisons of the results obtained at different and distant periods, have revealed another extraordinary fact, no less than that our own sun is not fixed in space, but that it is constantly moving forward towards a point in the constellation Hercules, at the rate, as it is supposed, of about 18,000 miles an hour, carrying with it the whole planetary and cometary system; and if our sun moves, probably all the other stars or suns move also, and the whole universe is in a perpetual state of motion through space.

The second subject to which the attention of private observers has been more particularly directed, is that of double or multiple stars, or those which, being situated very close to one another, appear single to the naked eye; but when viewed through powerful telescopes are seen to consist of two or more stars. The measuring the angles and distances from one another of the two or more component stars of these systems, has led to the discovery that many of these very close stars are, in fact, acting as suns to one another, and revolving round their common centre of gravity, each of them probably carrying with it a whole system of planets and comets, and, perhaps, each carried forward through space like our own sun. It became then a point of great interest to determine whether bodies so far removed from us as these systems observed Newton's law of gravity, and to this end it was necessary to observe the angles and distances of a great number of these double stars, scattered everywhere through the heavens, for the purpose of obtaining data to compute their orbits. This has been done, and chiefly by private observers; and the result is that these distant bodies are found to be obedient to the same laws that prevail in our own system.

The nebulæ are, as it were, systems or rings of stars scattered through space; at incredible distances from our star system, and perhaps from one anothere and there are many of these mysterious clouds of light, and there may be endless invisible regions of space similarly tenanted. Now, the nearest fixed star of our star system whose distance has been measured, is the brighest in the constellation Centaur, one of the southern constellations, and this nearest is yet so far removed, that it takes light, travelling at the rate of about 192,000 miles per second, three years to arrive at the earth from that star. When we gaze at it, therefore, we see it only as it existed three years ago; some great convulsion of nature may have since destroyed it. But there are many bright stars in our own system, whose distance is so much greater than this, as *a* Cygni, for example, that astronomers have not succeeded in measuring it. What, then, must be the distance of these nebulæ, with which so much space is filled; every component star in which may be a sun, with its own system of planets and comets revolving round it, each planet inhabited by myriads of inhabitants? What an overpowering view does this give us of the extent of creation! The component stars of these nebulæ are so faint, and, apparently, so close together, that it is necessary to use telescopes of great power, and with apertures so large as to admit a great amount of light for their observation. We owe it more especially to four individuals that telescopes have been constructed at a great cost and with great mechanical skill, sufficiently powerful to penetrate these depths of space. Those four individuals are the Herschels, father and son, Lord Rosse, and Mr. W. Lassell. That praiseworthy nobleman, Lord Rosse, began his meritorious career by obtaining a first class at this University, and has, as you know, spent large sums of money and displayed considerable mechanical genius in erecting, near his own castle in Ireland, an instrument of far greater power than any other in the world; and with it he has observed these nebulæ, and employed skilful artists to delineate their forms; and he has moreover made the very curious discovery, that some of them are arranged in a spiral form, a fact which gives rise to much interesting speculation on the kind of forces by which their parts are held together. It were much to be wished that observations similar to these, and with instruments of nearly the same power, should be made of the southern nebulæ also; that this generation might be able to leave to posterity a record of their present configurations. The distinguished astronomer, Mr. W. Lassell, the discoverer of Neptune's satellite, has just finished, at his own cost, an instrument equal to the task, mounted equatorially; and I am not without hope that it may, at perhaps no very distant period, be devoted to its accomplishment. A recent communication from him to the Astronomical Society expresses satisfaction with the mounting of his instrument, and after many trials its great speculum has at last come forth nearly perfect from his laboratory.

Of all the phenomena of the heavens, there are none which excite more general interest than comets—those vagrant strangers, the gipsies as they have been termed of our solar system, which often come we know not whence, and at periods when we least expect them; and such is the effect produced by the strangeness and suddenness of their appearance, and the mysterious nature of some of the facts connected with them, that while in ignorant times they excited alarm, they now sometimes seduce men to leave other employments and become astronomers. Now, though the larger and brighter comets naturally excite most general public interest, and are really valuable to astronomers, as exhibiting appearances which tend to throw light on the internal structure of these bodies, and the nature of the forces which must be in operation to produce the extraordinary phenomena observed, yet some of the smaller telescopic comets are, perhaps, more interesting in a physical point of view. Thus the six periodical comets, the orbits of which have been determined with tolerable accuracy, and which return at stated intervals, are extremely useful, as being likely to disclose facts of which, but for them, we should have ever remained ignorant. Thus, for example, when the comet of Encke, which performs its revolution in a period of a little more than three years, was observed at each return, it disclosed the important and unexpected fact, that its motion was continually accelerated. At each successive approach to the sun it arrives at its perihelion sooner and sooner; and there is no way for accounting for this so satisfactory as that of supposing that the space, in which the planetary and cometary motions are performed, is everywhere pervaded by a very rarefied atmosphere or ether, so thin as to exercise no perceptible effect on the movements of massive solid bodies like the planets, but substantial enough to exert a very important influence on more attenuated substances moving with great velocity. The effect of the resistance of the ether is to retard the tangential motion, and allow the attractive force of gravity to draw the body nearer to the sun, by which the dimensions of the orbit are continually contracted and the velocity in it augmented. The final result will be that, after the lapse of ages, this comet will fall into the sun; this body, a mere hazy cloud, continually flickering as it were like a celestial moth round the great luminary, is at some distant period destined to be mercilessly consumed. Now the discovery of this ether is deeply interesting as bearing on other important physical questions, such as the undulatory theory of light; and the probability of the future absorption of comets by the sun is important as connected with a very interesting speculation by Prof. William Thomson, who has suggested that the heat and light of the sun may be from time to time replenished by the falling in and absorption of countless meteors which circulate round him; and here we have a cause revealed which may accelerate or produce such an event.

In the progress of science it often happens that a particular class of observations, all at once, and owing to some peculiar circumstances, attracts very general attention and becomes deeply interesting. This has been the case within the last few years in reference to observations of the sun's disc, which were at one time made by very few individuals, and were indeed very much neglected both by professional and amateur astronomers. During this season of comparative neglect, there were not, however, wanting some enthusiastic individuals, who were in silence and seclusion obtaining data of great importance.

On the first of September last, at $11^{h}\ 18^{m}$ A.M., a distinguished astronomer, Mr. Carrington, had directed his telescope to the sun, and was engaged in observing his spots, when suddenly two intensely luminous bodies burst into view on its surface. They moved side by side through a space of about 35,000 miles, first increasing in brightness, then fading away; in five minutes they had vanished. They did not alter the shape of a group of large black spots which lay directly in their paths. Momentary as this remarkable phenomenon was, it was fortunately witnessed and confirmed, as to one of the brightest lights, by another observer, Mr. Hodgson, at Highgate, who, by a happy coincidence, had also his telescope directed to the great luminary at the same instant. It may be, therefore, that these two gentlemen have actually witnessed the process of feeding the sun, by the fall of meteoric matter; but however this may be, it is a remarkable circumstance, that the observations at Kew show that on the very day, and at the very hour and minute of this unexpected and curious phenomenon, a moderate but marked magnetic disturbance took place; and a storm or great disturbance of the magnetic elements occurred four hours after midnight, extending to the southern hemisphere. Thus is exhibited a seeming connection between magnetic phenomena and certain actions taking place on the sun's disc—a connection, which the observations of Schwabe, compared with the magnetical records of our Colonial Observatories, had already rendered nearly certain. The remarkable results derived from the comparison of the magnetical observations of Captain Maguire on the shores of the Polar Sea, with the contemporaneous records of these Observatories, have been described by me on a former occasion. The delay of the Government in re-establishing the Colonial Observatories has hitherto retarded that further development of the magnetic laws, which would doubtless have resulted from the prosecution of such researches.

We may derive an important lesson from the facts above alluded to. Here are striking instances in which independent observations of natural phenomena have been strangely and quite unexpectedly connected together; this tends powerfully to prove, if proof were necessary, that if we are really ever to attain to a satisfactory knowledge of Nature's laws, it must be accomplished by an assiduous watching of all her phenomena, in every department into which Natural Science is divided. Experience shows that such observations, if made with all those precautions which long practice combined with natural acuteness teaches, often lead to discoveries, which cannot be at all foreseen by the observers, though many years may elapse before the whole harvest is reaped.

I cannot allude to the subject of Arctic voyages without congratulating the Association on the safe return of Sir Leopold M'Clintock and his gallant band, after accomplishing safely and satisfactorily the object of their interesting mission. The great results accomplished with such small means, and chiefly by the display of those qualities of indomitable courage, energy, and perseverance which never fail the British seaman in the hour of need, are the theme of general admiration; but I may be permitted in passing to express some regret, that it was left to the devoted affection of a widowed lady, slightly aided by private contributions, to achieve a victory in which the honour of the nation was so largely involved,—the rather that the danger of the enterprise, the pretext for non-interference, was much enhanced thereby, and the accessions to our scientific and geographical knowledge proportionably curtailed.

The instances to which I have alluded are only a few of many which could be adduced of an insufficient appreciation of certain objects of scientific research. Large sums are expended on matters connected with science, but this is done on no certain and uniform system; and there is no proper security that those who are most competent to give good advice on such questions, should be the actual persons consulted. It was partly with the hope of remedying these defects and of generally improving the position of science in the country in its relation to the Government, that the Parliamentary Committee of this Association was established; and it was partly with the same hope that I was induced to accept the honourable office of President of the Royal Society, though conscious at the time that there were very many far better qualified than myself to hold it. Many of those whom I am now addressing are aware of the steps which were adopted by the Parliamentary Committee, and subsequently by the Committee of Recommendations of this association, for the purpose of collecting the opinions of the cultivators of science on the question,—Whether any measures could be adopted by Government or Parliament that would improve our position? The question was afterwards referred to and discussed by the Council of the Royal Society, who, on the 15th of January, 1857, agreed upon twelve resolutions in reply thereto. These resolutions recommend, among other things, that Government grants in aid of local funds should be applied towards the teaching of science in schools, the formation of Provincial Museums and Libraries, and the delivery of lectures by competent persons, accompanied by examinations; and finally, that some existing scientific body, or some Board to be created for the purpose, should be formally recognised, which might advise the Government on all matters connected with science, and especially on the prosecution, reduction, and publication of scientific researches, and the amount of Parliamentary or other grants in aid thereof; also on the general principles to be adopted in reference to public scientific appointments, and on the measures necessary for the more general diffusion of a knowledge of physical science among the nation at large; and which might also be consulted by the Government on the grants of pensions to the cultivators of science. I was requested to transmit these resolutions to Lord Palmerston, and also to the Parliamentary Committee of this Association. Since that period these resolutions have been discussed by that Committee; but partly because some of its most influential members have expressed grave doubts as to the expediency of urging their adoption at all, and partly for want of a favourable opportunity for bringing them forward, nothing further has as yet been done. I thought, however, that the time was arrived at which it was only proper that I should explain the steps which had been already taken, and the actual position in which the question now stands. If it be true, as some of our friends imagine, that the recognition of such a body as has been above described, however useful it might prove if the public were disposed to put confidence in its suggestions, would only augment that feeling of jealousy which is disposed to view every application for aid to scientific research in the light of a request for some personal boon, to be bestowed on some favoured individual, then indeed its institution would not be expedient. I only wish that persons who entertain such views would pay some attention to the working of the government grant committee of the Royal Society, a body composed of forty-two persons selected from among the most eminent cultivators of science, and which is entrusted with the distribution of an annual sum of £1,000, placed by Parliament at the disposal of the Royal Society, at the suggestion of Lord John Russell, in aid of scientific inquiries. One of the rules of that committee is, that no sum whatever shall be given to defray the merely personal expenses of the experimenters; all is spent on materials, and the construction or purchase of instruments, except in a very few and rare instances in which travelling expenses form the essential feature of the outlay. A list of the objects to which the grants are devoted has been published by Parliament; among them are interesting investigations into the laws of heat, the strength of materials used in building, the best form of boilers, from the bursting of which so many fatal accidents are continually occurring, the electric conductivity of metals, so important for telegraphic communication, and into many other questions, in the solution of which the public generally have the deepest interest. The cost of these researches has been defrayed by these valuable grants. They have provided also for the construction of better and standard meteorological and magnetical instruments, for the execution of valuable drawings of scarce fossils and zoological specimens collected with great labour by distinguished naturalists, for the reduction and publication of astronomical observations by some of our most highly-esteemed astronomers, and for physiological researches which have an important bearing on our knowledge of the human frame. Time, indeed, would fail me were I to attempt to describe all the good done, and perhaps evil prevented, by the distribution of these grants; and yet no portion of the money can be said to be really received by those to whom it is appropriated, inasmuch as it is all spent in the various means and appliances of research; in short, to quote from a letter addressed to the Secretary of the Treasury, at a time when the grant was temporarily withheld, "by the aid of this contribution, the Government has, in fact, obtained for the advancement of science and the national character the personal and gratuitous services of men of first-rate eminence, which, without this comparatively small assistance, would not have been so applied." I think that we were justified in terming this assistance small; for it is really so in comparison with the amount of other sums which are applied to analogous objects, but without that wholesome control of intelligent distributors, thoroughly and intimately conversant with the characters and competency of those who apply for the grants. The recognition of such a board as has been sketched out by the council of the Royal Society may not lead to a greater expenditure of public money; indeed, it is much more likely to curtail it; as some who now apply for aid through the interest of persons having influence with those in authority, who are generally but ill-informed on the subject-matter of the application, would hesitate long before they made a similar request to those who are thoroughly conversant with it; and it is on this account that comparatively few of the applications to the government grant committee are rejected. Moreover, inasmuch as every grant passed by the proposed board would afterwards receive the jealous scrutiny of Parliament, whose sanction must, of course, be obtained, I am disposed to think that were I to support the establishment of such a scientific council, or the formal recognition by the state of some existing scientific body in that capacity, I should be advocating that which would prove a valuable addition to the institutions of my country.

Having detailed some of the valuable services of our amateur astronomers, let me not be accused of being unjust to the professional contributors to the data of that noble science. Most valuable star catalogues have resulted from the labours of our public observatories, and from Greenwich in particular. There are also two observatories which have, as it were, a *quasi* public character, viz., the Radcliffe Observatory and that of Armagh, which have contributed much to this department of Astronomy. Your former president, the accomplished and learned Dr. Robinson, of Armagh, has lately presented to the astronomical world a catalogue of the places of more than 5,000 stars, and in so doing has conferred a most important benefit on his favourite science.

But it would be an unpardonable omission were I to neglect to express our gratitude to our great national institution at Greenwich for the manner in which it has consistently discharged the task imposed upon it by its founder and those who inaugurated its first proceedings. The duty assigned to it was "to rectify the tables of the motions of the heavens and the places of the fixed stars, in order to find out the so much desired longitude at sea, for perfecting the art of navigation;" and gloriously has it executed its task. For two centuries it has been at work, endeavouring to give to the determinations of the places of the principal fixed stars and of the heavenly bodies of our own solar system, and more especially of the moon, the utmost degree of precision; and during the same period, the master minds of Europe have been engaged in perfecting the analytical theory by which the many and most perplexing inequalities of the moon's motion must be accounted for and represented, before tables can be constructed giving the place of our satellite with that accuracy that the modern state of science demands.

The very important task of calculating such tables has just been finished. Our able and accomplished director of the national observatory, Mr. Airy, had caused all the observations of the moon made at Greenwich from 1750 to 1830, to be reduced upon one uniform system, employing constants derived from the best modern researches; and a distinguished Danish professor, who had been for some time engaged in calculating new tables of the moon, availed himself of the data so furnished. Professor Hansen happily brought to his task all the accomplishments of a practical observer, and of one of the most able analysts of modern times, combined with the most determined industry and perseverance. In the completion of it he was liberally assisted by our government, at the time when an unhappy war had deprived the Danish government of the means of further aiding their Professor, and a great astronomical work had been suspended for want of £300, a sum which many do not hesitate to spend on the purchase of some useless luxury. Prof. Hansen's tables are now finished and published. They agree admirably with the Greenwich observations with which they have been compared, and the mode of their execution has been approved by those competent to express an opinion on such a subject. They have been rewarded also with the gold medal of the Astronomical Society, a distinction never lightly bestowed.

In paying this tribute to the merit of Prof. Hansen, I must not be understood as wishing to ignore, far less depreciate, that of three very eminent geometers—Plana, Lubbock, and Pontécoulant, who have devoted years of anxious and perhaps ill-requited labour to the investigation of the lunar inequalities, but who have never yet embodied the results in the only form useful to navigation, that of tables.

A curious controversy has lately arisen on the subject of the acceleration of the moon's motion, which is now exciting great interest among mathematicians and physical astronomers. Prof. Adams and M. Delaunay take one view of the question; MM. Plana, Pontécoulant, and Hansen the other. Mr. Airy, Mr. Main, the President of the Astronomical Society, and Sir John Lubbock support the conclusions at which Prof. Adams has arrived. The question in dispute is strictly mathematical; and it is a very remarkable circumstance in the history of astronomy, that such great names should be ranged on opposite sides, seeing that the point involved is really no other than whether certain analytical operations have been conducted on right principles; and it is a proof, therefore, if any were wanting, of the extraordinary complexity and difficulty of these transcendental inquiries. The controversy is of the following nature:—The moon's motion round the earth, which would be otherwise uniform, is disturbed by the sun's attraction; any cause therefore which affects the amount of that attraction affects also the moon's motion: now, as the eccentricity of the earth's orbit is gradually decreasing, the average distance of the sun is slightly increasing every year, and his disturbing force becomes less; hence the moon is brought nearer the earth, but at the rate of less than one inch yearly; her gravitation towards the earth is greater, and her motion is proportionably accelerated. It is on the secular acceleration of the moon's mean motion, arising from this minute yearly approach, that the dispute has arisen; so infinitesimally small are the quantities within the reach of modern analysis. Mr. Adams asserts that his predecessors have improperly omitted the consideration of the effect produced by the action of that part of the sun's disturbing force which acts in the direction of a tangent to the moon's orbit, and which increases the velocity; his opponents deny that it is necessary to take this into account at all. Had not M. Delaunay, an able French analyst, by a perfectly independent process, confirmed the results of Prof. Adams, we should have had the English and Continental astronomers waging war on an algebraical question. On the other hand, however, the computations of the ancient lunar eclipses support the views of the Continent; but if Mr. Adams's mathematics are correct, this only shows that there must be other causes in operation, as yet undiscovered, which influence the result; and it is not at all unlikely that this most curious and interesting controversy will eventually lead to some important discovery in physical astronomy.

You are aware that at the suggestion of Sir John Herschel an instrument was constructed for the Kew Observatory, to which the name of Photoheliograph has been given, because it is adapted solely to the purpose of obtaining photographic representations of the appearances of the sun's disc. Many difficulties have been encountered in the use of this instrument; but by the zealous exertions of the late Mr. Welsh, Mr. Beckley, and Mr. De la Rue, they have been overcome. It is to the last-named gentleman, so distinguished for his successful prosecution of celestial photography, that the Royal Society have entrusted a grant of money to enable him to transport the photoheliograph to Spain, to observe the total eclipse of the sun, which is now approaching, and great interest will attach to records of the phenomena of the eclipse thus obtained.

In chemistry I am informed that great activity has been displayed, especially in the organic department of the science. For several years past processes of substitution (or displacement of one element or organic group by another element or group more or less analogous) have been the main agents employed in investigation, and the results to which they have led have been truly wonderful; enabling the chemist to group together several compounds of comparatively simple constitution into others much more complex, and thus to imitate, up to a certain point, the phenomena which take place within the growing plant or animal. It is not indeed to be anticipated that the chemist should ever be able to produce, by the operations of the laboratory, the arrangement of the elements in the forms of the vegetable cell or the animal fibre; but he may hope to succeed in preparing some of the complex results of secretion or of chemical changes produced within the living organism,—changes which furnish definite crystallizable compounds, such as the formiates and the acetates, and which he has actually obtained by operations independent of the plant or the animal.

Hofmann, in pursuing the chemical investigation of the remarkable compound which he has termed *Triethylphosphine*, has obtained some very singular compound ammonias. Triethylphosphine is a body which takes fire spontaneously when its vapour is mixed with oxygen, at a temperature a little above that of the body. It may be regarded as ammonia in which an atom of phosphorus has taken the place of nitrogen, and in which the place of each of the three atoms of hydrogen in ammonia is supplied by ethel, the peculiar hydrocarbon of ordinary alcohol. From this singular base Hofmann has succeded in procuring other coupled bases, which though they do not correspond to any of the natural alkalies of the vegetable kingdom, such as morphia, quinia, or strychnia, yet throw some light upon the mode in which complex bodies more or less resembling them have been formed.

The power which nitrogen possesses of forming a connecting link between the groups of substances of comparatively simple constitution, has been remarkably exemplified by the discovery of a new class of amide acids by Griess, in which he has pointed out a new method, which admits of very general application, of producing complex bodies related to the group of acids, in some measure analogous to the poly-ammonias of Hofmann.

Turning to the practical applications of chemistry, we may refer to the beautiful dyes now extracted from aniline, an organic base formerly obtained as a chemical curiosity from the products of the distillation of coal-tar, but now manufactured by the hundred weight in consequence of the extensive demand for the beautiful colours known as Mauve, Magenta, and Solferino, which are prepared by the action of oxidizing agents, such as bichromate of potash, corrosive sublimate, and iodide of mercury upon aniline.

Nor has the inorganic department of chemistry been deprived of its due share of important advances. Schonbein has continued his investigations upon ozone, and has added many new facts to our knowledge of this interesting substance; and Andrews and Taite, by their elaborate investigations, have shown that ozone, whether admitted to be an allotropic modification of oxygen or not, is certainly much more dense than oxygen in its ordinary condition.

In metallurgy we may point to the investigations of Deville upon the platinum group of metals, which are especially worthy of remark on account of the practical manner in which he has turned to account the resources of the oxy-hydrogen blow-pipe, as an agent which must soon be very generally adopted for the finer description of metallurgic operations at high temperatures. By using lime as the material of his crucibles, and as the support for the metals upon which he is operating, several very important practical advantages have been obtained. The material is sufficiently infusible to resist the intense heat employed; it is a sufficiently bad conductor of heat to economize very perfectly the high temperature which is generated; and it may be had sufficiently free from foreign admixture to prevent it from contaminating the metals upon which the operator is employed.

The bearing of some recent geological discoveries on the great question of the high antiquity of man was brought before your notice at your last meeting, at Aberdeen, by Sir Charles Lyell, in his opening address to the geological section. Since that time many French and English naturalists have visited the valley of the Somme in Picardy, and confirmed the opinion originally published by M. Boucher de Perthes, in 1847, and afterwards confirmed by Mr. Prestwich, Sir C. Lyell, and other geologists, from personal examination of that region. It appears that the position of the rude flint-implements, which are unequivocally of human workmanship, is such, at Abbeville and Amiens, as to show that that they are as ancient as a great mass of gravel which fills the lower parts of the valley between those two cities, extending above and below them. This gravel is an ancient fluviatile alluvium by no means confined to the lowest depressions (where extensive and deep peat-mosses now exist), but is sometimes also seen covering the slopes of the boundary hills of chalk at elevations of 80 or 100 feet above the level of the Somme. Changes, therefore, in the physical geography of the country, comprising both the filling up with sediment and drift, and the partial re-excavation of the valley, have happened since old river-beds were, at some former period, the receptacles of the worked flints. The number of these last, already computed at above 1,400 in an area of fourteen miles in length, and half a mile in breadth, has afforded to a succession of visitors abundant opportunities of verifying the true geological position of the implements.

The old alluvium, whether at higher or lower levels, consists not only of the coarse gravel with worked flints above mentioned, but also of superimposed beds of sand and loam, in which are many fresh water and land shells, for the most part entire, and of species now living in the same part of France. With the shells are found bones of the mammoth and an extinct rhinoceros, *R. tichorhinus*, an extinct species of deer, and fossil remains of the horse, ox, and other animals. These are met with in the overlying beds, and sometimes also in the gravel where the implements occur. At Menchecourt, in the suburbs of Abbeville, a nearly entire skeleton of the Siberian rhinoceros is said to have been taken out about forty years ago, a fact affording an answer to the question often raised, as to whether the bones of the extinct mammalia could have been washed out of an older alluvium into a newer one, and so redeposited and mingled with the relics of human workmanship. Far-fetched as was this hypothesis, I am informed that it would not, if granted, have seriously shaken the proof of the high antiquity of the human productions, for that proof is independent of organic evidence or fossil remains, and is based on physical data. As was stated to us last year by Sir C. Lyell, we should still have to allow time for great denudation of the chalk, and the removal from place to place, and the spreading out over the length and breadth of a large valley of heaps of chalk flints in beds from 10 to 15 feet in thickness, covered by loams and sands of equal thickness, these last often tranquilly deposited, all of which operations would require the supposition of a great lapse of time.

That the mammalia fauna, preserved under such circumstances, should be found to diverge from the type now established in the same region, is consistent with experience; but the fact of a foreign and extinct fauna was not needed to indicate the great age of the gravel containing the worked flints.

Another independent proof of the age of the same gravel and its associated fossiliferous loam is derived from the large deposits of peat above alluded to, in the Valley of the Somme, which contain not only monuments of the Roman, but also those of an older stone period, usually called Celtic. Bones, also, of the bear, of the species still inhabiting the Pyrenees, and of the beaver, and many large stumps of trees, not yet well examined by botanists, are found in the same peat, the oldest portion of which belongs to times far beyond those of tradition; yet distinguished geologists are of opinion that the growth of all the vegetable matter, and even the original scooping out of the hollows containing it, are events long posterior in date to the gravel with flint implements, nay, posterior even to the formation of the uppermost of the layers of loam with freshwater shells overlying the gravel.

The exploration of caverns, both in the British isles and other parts of Europe, has in the last few years been prosecuted with renewed ardour and success, although the theoretical explanation of many of the phenomena brought to light seems as yet to baffle the skill of the ablest geologists. Dr. Falconer has given us an account of the remains of several hundred hippopotami, obtained from one cavern, near Palermo, in a locality where there is now no running water. The same palæontologist, aided by Col. Wood, of Glamorganshire, has recently extracted from a single cave in the Gower peninsula of South Wales, a vast quantity of the antlers of a reindeer (perhaps of two species of reindeer), both allied to the living one. These fossils are most of them shed horns; and there have been already no less than 1,100 of them dug out of the mud filling one cave.

In the cave of Brixham, in Devonshire, and in another near Palermo, in Sicily, flint implements were observed by Dr. Falconer, associated in such a manner with the bones of extinct mammalia, as to lead him to infer that man must have co-existed with several lost species of quadrupeds; and M. de Vibraye has also this spring called attention to analogous conclusions, at which he has arrived by studying the position of a human jaw with teeth, accompanied by the remains of a mammoth, under the stalagmite of the Grotto d'Arcis, near Troyes, in France.

In the recent progress of physiology, I am informed that the feature perhaps most deserving of note on this occasion, is the more extended and successful application of chemistry, physics, and the other collateral sciences to the study of the animal and vegetable economy. In proof, I refer to the great and steady advances which have, within the last few years, been made in the chemical history of nutrition, the statics and dynamics of the blood, the investigation of the physical phenomena of the senses, and the electricity of nerves and muscles. Even the velocity of the nerve force itself has been submitted to measurement. Moreover, when it is now desired to apply the resources of geometry or analysis to the elucidation of the phenomena of life, or to obtain a mathematical expression of a physiological law, the first care of the investigator is to acquire precise experimental data on which to proceed, instead of setting out with vague assumptions, and ending with a parade of misdirected skill, such as brought discredit on the school of the mathematical physicians of the Newtonian period.

But I cannot take leave of this department of knowledge without likewise alluding to the progress made in scrutinizing the animal and vegetable structure by means of the microscope—more particularly the intimate organization of the brain, spinal cord, and organs of the senses; also to the extension, through means of well-directed experiment, of our knowledge of the functions of the nervous system, the course followed by sensorial impressions and motorial excitement in the spinal cord, and the influence exerted by or through the nervous centres on the movements of the heart, blood-vessels and viscera, and on the activity of the secreting organs;—subjects of inquiry, which, it may be observed, are closely related to the question of the organic mechanism whereby our corporeal frame is influenced by various mental conditions.

Previously to the delivery of the presidential address, a business meeting was held, at which was read the report of the Kew Committee.

Since the last meeting of the British Association, the self-recording magnetographs have been in constant operation under the able superintendence of Mr. Chambers, the magnetical assistant. A description of these instruments has been given by Mr. Stewart the superintendent, in a report which is printed in the transactions of the British Association for 1859. The drawings for the plates connected with this report were made with much skill by Mr. Beckley, the mechanical assistant at Kew.

It was mentioned in the last report of this committee, that a set of self-recording magnetic instruments, designed for the first of the colonial observatories which have been proposed to Her Majesty's Government, had been completed and set up in a wooden house near the observatory. Shortly after the meeting at Aberdeen, the chairman received a letter from Dr. P A. Bergsma, geographical engineer for the Dutch Possessions in the Indian Archipelago, requesting that the committee would assist him in procuring a set of self-recording magnetic differential instruments similar to those at Kew, the Dutch Government having resolved to erect such at their observatory at Java. In consequence of this application, and as the instruments which had been completed were not immediately required for a British observatory, it was resolved that they should be assigned to Dr. Bergsma; this gentleman has since arrived, and has for the last few weeks been engaged at the observatory in the examination of his instruments.

The usual monthly absolute determinations of the magnetic elements continue to be made.

Application having been made through Padre Secchi, of the Collegio Romano, for a set of magnetic instruments, for both differential and absolute determinations for the Jesuits' College at Havanna, the whole to cost 600 dollars or about £150, Gen. Sabine obtained, at a reasonable price, the three magnetometers that had formerly been employed at Sir T. Brisbane's observatory at Makerstoun, and also an altitude and azimuth instrument. With these instruments it is expected that the application from Havanna observatory can be met within the sum named; the instruments are now in the hands of the workmen, and will be ready early in July.

Two unifilars, supplied by the late Mr. Jones, for the Dutch Government (one for Dr. Bergsma, and the other for Dr. Buys Ballot), have had their constants determined. Observations have also been made with two 9-inch dip-circles belonging to Gen. Sabine, which have been repaired by Barrow, and with two dip-circles and a Fox's instrument designed for Dr. Bergsma.

A set of magnetical instruments, consisting of a dip-circle, an azimuth compass, and a unifilar, previously used by Capt. Blakiston, have been re-examined, and have been taken by Col. Smythe, of the Royal Artillery, to the Feejee Islands.

As it was feared that the Kew standard barometer might have been injured by the workmen who some time since were repairing the observatory, a new one has been mounted. The mechanical arrangements of this instrument have been completed in a very admirable manner by Mr. Beckley; and the mean of all the observations made shows that the new barometer reads precisely the same as the old. This result is satisfactory, not only as showing that no change has taken place in the old barometer but as confirming the accuracy of the late Mr. Welsh's process of constructing these instruments. The height of the cistern of the new barometer above the level of the sea, is 33·74 feet.

Mr. Valentine Magrath having quitted the observatory, at his own request, on the 14th of February last, Mr. George Whipple has taken his place as meteorological assistant, and has given much satisfaction. On the 12th of March, Thomas Baker was engaged at the weekly salary of 8s., to be raised to 10s. in six months if he gave satisfaction, which has hitherto been the case.

Since the last meeting of the association, 173 barometers and 222 thermometers have been verified at the observatory.

Prof. Kupffer, director of the Russian magnetical and meteorological observatories, visited the observatory, and was presented with a standard thermometer. Mr. J. C. Jackson, Lieut. Goodall, R.E., and Mr. Francis Galton, have visited the observatory, and received instructions in the manipulation of instruments.

Mr. Galton has made some experiments at Kew observatory, to determine the most practicable method of examining sextants, and other instruments for geographical purposes. Considering that these instruments, after having been once adjusted, are liable to two distinct classes of error, the one *constant* for any given reading, and the other *variable*, it is an object to form tables of corrections for the constant errors of instruments sent for examination, and also to ascertain the amount of variable errors which might affect their readings. As a ground-work for examination, it is found that small mirrors may be permanently adjusted, at the distance of half a mile, so that when the rays of a mirror of moderate size, standing by the side of an assistant, are flashed upon them, they may re-reflect a brilliant star of solar light, towards the sextant under examination. By having four permanently fixed mirrors of this description, separated by intervals of 20°, 60°, and 40° respectively, and by flashing upon them with two-looking glasses of moderate size, it is possible, by using every combination of these angles, to measure every twentieth degree, from 0° to 120°. The disturbing effects of parallax are eliminated without difficulty, by mere attention to the way in which the sextant is laid on the table, or, in the case of a zero determination, by a simple calculation. Moreover, the brilliancy of the permanent mirrors is perfectly under control, by the interposition of gauze shades in front of the looking-glasses that flash upon them. This renders an examination of the coloured shades a matter of great ease and certainty. Based upon these principles, Mr. Galton has drawn up a system for the thorough examination of sextants. Each would not occupy more than two hours in having its constant errors tabulated, and its variable errors determined; nor would an outlay of more than £30 be required for the establishment of fixed tables and permanent marks. Difficulty is, however, felt in setting the system in action, owing to the absolute need of an assistant having leisure to undertake it.

The sum of £179 12s. 6d. has been received from the Royal Society, to defray the expense of erecting a model house for the reception of the instruments for colonial magnetic observatories.

The Photoheliograph has been an occasional source of occupation to the mechanical assistant; but before daily records of the sun's disc can be obtained, it is absolutely requisite that an assistant should be appointed to aid Mr. Beckley, because his duties are of such a nature as to prevent his devoting attention at fixed periods of the day to an object requiring so much preparation, as is the case with photoheliography. Unfortunately, the funds at the disposal of the committee are quite inadequate for this purpose, and unless a special grant be obtained, the photoheliograph will remain very little used. At present Mr. Beckley is preparing the instrument, under Mr. De la Rue's direction, for its intended trip to Spain for the purpose of photographing the eclipse which takes place on July the 18th. The expenses of these preparations, and of the assistants who will accompany Mr De la Rue, will be defrayed out of the grant of the Royal Society for that object. The requisite preparations are somewhat extensive; for it has been deemed necessary to construct a wooden observatory, and to make a new iron pillar to support the instrument, adapted to the latitude of the proposed station—both the observatory and the iron pillar may be taken to pieces to facilitate their transport. The wooden house is eight feet six inches square, by seven feet high; it is entirely open at the top, except that portion divided off for a photographic room. The open roof will be covered by canvas when the observatory is not in use, and when in use, the canvas will be drawn back, so as to form an outer casing at some little distance from the wall of the photographic room; and, in order to keep this room as cool as possible, the canvas will, in case of need, be kept wetted. The chemicals and chemical apparatus will be packed in duplicate sets, so as to provide as far as possible against the contingency of loss, by breakage or otherwise, of a part of them. Mr. Downes, of the firm of Cundall and Downes, of Bond Street, has promised to accompany the expedition; Mr. Beckley will also go; and Mr. De la Rue has engaged Mr. Reynolds to assist in the erection of the observatory in Spain, and in the subsequent photographic operations. The Admiralty, on the representation of the Astronomer Royal, have provided a steam ship to convey this and other astronomical expeditions to Bilboa and Santander. It is proposed that the Kew party should land at Bilboa and proceed to Miranda. Mr. Vignoles, who is constructing the Tudela and Bilboa railway, has kindly promised his aid and that of his staff of assistants, to promote the objects of the expedition, and promises, on behalf of the contractors, the use of horses and carts for the conveyance of the apparatus. The expedition will sail from Portsmouth on the 7th of July, and should the weather prove favourable, there is reasonable hope that the various phases of the eclipse will be successfully photographed. Whether the light of the corona and red prominences will be sufficiently bright to impress their images, when magnified to four inches in diameter, is a problem to be solved only by direct experiment.

Professor W. Thomson, of Glasgow, having expressed a desire that the practical utility of his self-recording electrometer should be tried at Kew, his wish has been acceded to and the instrument received, and it is expected that it will shortly be in operation under his direction.

A report has been completed by the superintendent, on the results of the magnetic survey of Scotland and the adjacent islands, in the years 1857 and 1858, undertaken by the late Mr. Welsh.

Correspondence between General Sabine and the Rev. William Scott, Director of the Sydney observatory, was read.

The establishment of a magnetical observatory at Vancouver's Island is postponed, in consequence of the war with China precluding the establishment at present of a corresponding observatory at Pekin. On this subject some correspondence was also read.

The committee have thought that it might not prove uninteresting to the members of the British Association if, in this report, a short description were given of the Kew observatory, and of the nature and amount of work which is accomplished therein.

The observatory is situated in the middle of the old Deer Park, Richmond, Surrey, and is about three-quarters of a mile from the Richmond railway station. Its longitude is 0 deg. 18 min. 47 sec. W., and its latitude is 51 deg. 28 min. 6 sec. N. It is built north and south. The repose produced by its complete isolation is eminently favourable to scientific research. In one of the lower rooms a set of self recording magnetographs, described in the report of the last meeting of this Association, is constantly at work. These instruments, by the aid of photography, furnish a continuous record of the changes which take place in the three magnetic elements, viz., the declination, the horizontal force, and the vertical force. The light used is that of gas, in order to obtain which, pipes have been carried across the park to the observatory, at an expense of £250, which sum was generously defrayed by a grant from the Royal Society. Attached to this room is another, of a smaller size, in which the necessary photographic operations connected with magnetography are conducted.

In the story above the basement, the room by which the visitors enter the observatory is filled with apparatus. Much of this is the property of the Royal Society, and some of the instruments possess an historical value; for instance, the air-pump used by Boyle, and the convertible pendulum designed by Captain Kater, and employed by him, and subsequently by General Sabine, in determining the length of the pendulum vibrating seconds. An inner room which opens from this one, is used as a library and sitting room, and in it the calculations connected with the work of the observatory are performed. In this room dipping needles and magnets, which it is necessary to preserve from rust, are stored. Here also the MS. of the British Association catalogue of stars is preserved. A room to the east of this contains the standard barometers, and the apparatus (described by Mr. Welsh in the *Transactions* of the Royal Society, vol. 146, p. 507) for verifying and comparing marine barometers with the standard. This room has also accommodation for the marine barometers sent for verification. In the middle of the room is a solid block of masonry, extending through the floor to the ground below. To this an astronomical quadrant was formerly attached; it is now used as a support for the standard barometers. This room contains also a photographic barograph, invented by Mr. Francis Ronalds, which, though not at present in operation, may serve as a model for any one who wishes to have an instrument of this description. It is described by Mr. Ronalds in the Report of the British Association for 1851. In a room to the west of the library, thermometers for the Board of Trade, the Admiralty, and opticians, are compared with a standard thermometer by means of a very simple apparatus devised by the late Mr. Welsh. The observatory also possesses a dividing engine by Perreaux, by means of which standard thermometers are graduated. It was purchased by a grant from the Royal Society. In this room the pure water required for photographic processes is obtained by distillation; and here also a small transit telescope is placed for ascertaining time. The transit instrument is erected in a line between two meridian marks, one to the north, and the other to the south of the observatory; so that, by means of suitable openings, either of these marks may be viewed by the telescope.

In a higher story is the workshop, containing among other things, a slide-lathe by Whitworth, and a planing machine by Armstead, both of which were presented to the Kew observatory by the Royal Society.

In the dome is placed the photoheliograph for obtaining pictures of the sun's disc; attached to the dome there is a small chamber in which the photographic processes connected with the photoheliograph are conducted. This chamber is supplied with water by means of a force pump. A self-recording Robinson's anemometer is also attached to the dome.

In addition to the rooms now specified, there are the private departments attached to the observatory.

On the north side of the observatory, there is an apparatus similar to that used at the Toronto observatory, for containing the wet and dry bulb, the maximum and the minimum thermometers.

The model magnetic house, elsewhere alluded to in this report, stands at a distance of about sixty yards from the observatory, and the small wooden house in which the absolute magnetic observations are made, at a distance of about 110 yards. These houses are within a wooden paling, which fences them off from the remainder of the park, and encloses about one acre of ground attached to the observatory.

The work done may now be briefly specified. In the first place, the self-recording magnetographs, as already mentioned, are kept in constant operation, and record the changes continually occurring in the magnetic elements. The photographs are sent to General Sabine's establishment at Woolwich, to undergo the process of measurement and tabulation. In the model magnetic house there is at present a set of magnetographs which Dr. Bergsma will take to Java. When this set is removed, another will supply its place in readiness for any other observatory, colonial or foreign, at which it may be required. In the house for absolute determinations, monthly values of the declination, dip, and horizontal magnetic force are taken; and magnetic instruments for foreign or colonial observatories have their constants determined. In the meteorological department, all the barometers, thermometers, and hydrometers required by the Board of Trade and the Admiralty have their corrections determined, besides which, several instruments are verified for opticians. Standard thermometers also are graduated, and daily meteorological observations are made, an abstract of which is published in the *Illustrated London News*. Instruction is also given in the use of instruments to officers in the army or navy, or other scientific men who obtain permission from the committee. All this amount of work, it is believed, can be executed by the present staff, consisting of the superintendent, three assistants (magnetical, mechanical, and meteorological), and a boy; but the expense attending it is greater than the present income of the observatory, furnished by the British Association, will support.

In the resolution of the British Association of the 14th September, 1859, it was recommended to Government, at the instance of the joint committee of the Royal Society and British Association, that the sum of £350 per annum should be placed at the disposal of the general superintendent of the magnetical observations; this sum was intended to have defrayed the expenses attending the magnetical department of the observatory, and the observations of the sun's spots. It will be seen, however, from the correspondence contained in an earlier part of this report, that this source of income is not yet available.

June, 18, 1860. John P. Gassiot, Chairman.

ROYAL INSTITUTION.

June 1, 1860.

"Remarks on some Alpine phenomena," by John Tyndall, Esq., F.R.S. The discourse consisted of an account of a winter's expedition to the Alps, undertaken at the close of December, 1859. The speaker remained two nights at the Montanvert; and determined with a theodolite, the motion of the Mer-de-glace. This amounted to about one-half of the summer motion, and exhibited the results, as regards the quicker motion of the centre, established by measurements made in summer. He described the crystals of the snow which fell almost without intermission during the progress of the measurements. He afterwards visited the vault of the Arveiron, and found a turbid stream issuing from it, indicating that even in winter the motion of the glacier along its bed, by which the rocks over which it passes are ground, is not suspended even in winter.

The gorgeous crimson of the western heaven as observed from the vault gave occasion for some observations and experiments on the colour of the sky. The hypotheses of Newton and Goethe were referred to, as were also the memoirs of Clausius and Brücke. It was explained that the blue of the firmament is due to reflected light, and the morning and evening red to transmitted light.

June 8.

"On M. Bonelli's application of electricity to figure weaving," by Professor Faraday, D.C.L., F.R.S.:—

"Instead of the many pierced cards used in jacquard weaving, M. Bonelli has but one card, or rather its equivalent, a convertible plate of brass; which being pierced with the full number of holes required (which in the loom in action was 400) can have these holes either stopped or left open so as to represent by its successive changes of condition the successive cards of the jacquard series. To obtain this effect, tin foil is attached strongly to paper, so as to form a compound sheet. The design is then drawn upon the metallic surface with black bituminous varnish, and the sheet is made into an endless band, which being placed upon a roller, and kept in its position by stops, moves as the roller moves, being carried forward by its motion. A set of teeth rests upon the top of this roller, touching the pattern in a line; they are made of thin brass plate, so thin that 400 of them do not occupy more than 16 or 17 inches, *i.e.*, the width of the design on the roller; yet so separate that each is insulated from its neighbour by little interposed teeth of ivory; and so large and therefore weighty as to fall and rest upon the pattern, making good electrical contact where the tin foil is exposed, but being insulated where the bituminous pattern intervenes.

"Behind these teeth 400 small electro-magnets are fixed in a frame-work, parallel to each other, and insulated. The fine covered wires which constitute their helices are connected at one set of ends with the teeth just described, each with a tooth; whilst the other ends are brought together and made fast to one metallic plate and wire. Tracing this wire onwards, it comes to an interrupter or contact maker from whence the metallic communication proceeds to a screw appointed to communicate with one end of a five-celled. Bunsen battery, the other end of which communicates with a screw near the former This screw has a wire proceeding from it to two insulated teeth, like the teeth bearing upon the pattern, but heavier; and these rest upon the uncovered edges of the tin foil at the sides of the pattern, so as to keep up a constant electric communication with it. By simple but perfect and secure mechanical arrangements, the following movements and results take place in this part of the apparatus. As the pedal descends under the weaver's foot at a certain time, the 400 teeth descend upon the pattern; then the circuit is completed at the interrupter in the single wire, the electric current passing through that wire is divided into as many portions as there are teeth touching the metal in the line of pattern under realization; it makes all the electro-magnets surrounded by these wires active, leaving the others non-magnetic; and then, as the foot is raised and the movements return in their course, the interrupter is first separated, which, causing all current to cease, the magnets lose their power, the teeth are raised from the pattern; and then the cylinder carrying it moves forward just so much as to give the new line of pattern for the teeth to search out electrically (the next time they descend), which corresponds to the next cast of the weft thread. Because the pattern never moves, whilst it is in contact with the teeth, it is not cut or worn by them; because the current is made by the interrupter after the teeth are in contact, and before they are separated, no fusion or burning of the metal occurs at the teeth; and because there is a tongue-like wiper or brush, which at the right time passes under the teeth, sustains them, and from off which they rub on to the pattern, there is never any want of cleanliness or of contact there.

"Associated with these 400 magnets, and in the same line with them, are 400 cylinders of soft iron, called pistons; they are carried in a frame which moves to and fro horizontally between the magnets and the horizontal rods belonging to the suspensions of the warp threads; and they move towards the magnets at a time so adjusted as to coincide with the passage of the electricity round its circuit: they find therefore some of the magnets excited, because their teeth touch the metal of the pattern; and, as the box of pistons begins to return before the current is interrupted, such of the pistons as have touched excited magnets are retained or held back, whilst others have returned in their course: the pistons therefore are divided into two intermixed groups, of which the one group is perhaps half an inch behind the other. Now comes in the action of the perforated brass plate, which is to be converted for the time into the equivalent of the particular jacquard card required. It is a vertical plate, associated with the extremities of the pistons farthest from the electro-magnets: it can move up and down to a small extent; it is pierced by 400 circular holes. The 400 pistons have each a head or button, which can pass freely each through its correspondent hole when the plate is up, but is stopped at the hole when the plate is down, and then effectually closes it. Now the time is so adjusted, that when the box of pistons has moved so far forward as to cause separation of the two groups, the plate descends, and by locking such of the heads as belong to the unretained group, fills the correspondent holes, whilst the heads of the retained group, being already behind their holes, have left them open; and so the jacquard plate is formed, and, moving a little further it acts on the horizontal rods before mentioned, and having by that arranged the suspenders of the warp threads, it then goes back, or towards the electro-magnets to take up, under the influence of the currents of electricity through the selecting teeth, the new arrangement of apertures required for the next cast of the weft thread."

ASSOCIATION OF FOREMEN ENGINEERS.

July 7, 1860.

"On the development of the iron trade," by Mr. James Robertson. He commenced by stating that it would be necessary for him to take as a starting point the year 1740. It was in that year that the iron trade of this country had fallen into a state of great depression. The mode of manufacturing the metal began to be better understood, and the growing wants of society gave a corresponding impetus to its production. Agriculture came to its aid, and the cumbrous wooden ploughs which for many centuries had been used for tilling the soil, gradually disappeared. Wheelless waggons or sledges more properly, fell into disuse. Iron tyres for wheels were adopted, and other changes of a similar nature were in course of introduction. Unhappily, however, whilst these advancements in the peaceful arts were progressing, those of a warlike nature were not stationary. Cannon for the navy and army were augmented in number and calibre, the demand for smaller weapons for both services keeping pace with the increase. Then came the civil engineers with their designs for iron bridges, the first cast-iron one being erected near Coalbrookdale, in Shropshire, in 1777. The second of these structures was designed by the notorious Thomas Paine, and erected at Bishopwearmouth, Sunderland. These, and other public works requiring the liberal employment of iron, gave an increased impetus to the trade, whilst the formation of canals facilitated the transmission of the metal to the most distant parts of the empire. Our colonies, again, advancing in friendly rivalry with the mother country, became the recipients of vast quantities of iron. The steam-engine, however, is the chief agent in the development of the iron trade. The steam-engine, that wondrous machine which has done so much for our manufactures, which has multiplied almost indefinitely the means of communicating knowledge, which has aided and advanced our literature, hastened on civilization, and contributed to the material comfort of the inhabitants of the earth! Tracing next the history of the steam-engine from the time of the Marquis of Worcester to that of James Watt, the reader of the paper passed an eloquent eulogium upon the man of Greenock, and drew from his life and character some lessons of a practical character. In conclusion, Mr. Robertson spoke of the impossibility of dealing with so vast a subject as he had chosen for illustration in the brief compass of a paper like the present. The marine engine he must leave untouched though the influence of steam navigation on the development of the iron trade was enormous. Railways, too, must be passed over, for the present at least, whilst the iron and steel manufactures of Birmingham, Sheffield, Manchester, and Glasgow could be barely mentioned. Ere the year had passed away, he hoped to pursue the subject yet further, although to do it justice was impossible.

MECHANIC'S LIBRARY.

Botanist's Companion, crown 8vo, 2s. 6d. cloth. Balfour.
Botany, Popular British, 4th edition, 16mo., 7s. 6d. cloth. Catlow.
Body, The Human, and its connection with Man, 5s. Wilkinson.
Carpenters' Assistant, and Joiners', folio, illustrated, 56s. Newland.
Entomology, Popular British, new edition, 16mo., 7s. 6d. cloth. Catlow.
Eclipse, Observations on the, of the Sun, July, 1860, 10s. 6d. Vignoles.
Ferns, Plain and easy account of the British, new edition, fcap. 8vo., 2s. 6d.
History, Natural, Curiosities of, fcap. 8vo, 6s. cloth. Buckland.
Printing and its Accessories, crown 8vo., 21s. cloth. Ruse and Straker.
Rifle, Three Lectures upon the, 2d edition, fcap. 8vo., 2s. Wilford.
Sea Weeds, Nature Printed, vol. 4, 42s. cloth. Johnstone and Croall.

MONTHLY NOTES.

MARINE MEMORANDA.

The large steam tug *Emperor*, built by Messrs. Marshall Brothers, of South Shields, has just made the run from the Tyne to Liverpool in the space of 83 hours. The *Emperor* is a paddle steamer of the following dimensions:—130 feet long, 22 feet beam, 10 feet deep; built of iron; fitted with a pair of disconnecting side lever engines of 90 horse power nominal; strong tubular boilers, and all the latest improvements.

The paddle wheel steam vessel *Rhadamanthus*, Master Commander F. R. Sturdee, performed the run from Portsmouth to Woolwich in 23 hours and a quarter. The officers of the ship give a favourable account of the working of Mr. Wetherhead's superheating steam apparatus, and state that the economy in fuel as verified by the consumption of coals was equal to from 20 to 25 per cent., and that the labour of the stokers is considerably reduced, two watches being now sufficient to keep up the fires in the place of three as heretofore.

The Atlantic Royal Mail Company's steam ship, *Pacific*, Captain W. H. Embleton, having undergone a thorough refit and examination, proceeded, prior to her departure for Galway, on an official trial trip to Stokes Bay, for the purpose of testing her capabilities at the measured mile. After making several runs the average speed obtained was equal to 12¼ knots per hour. The *Pacific* is a fine steamer of 1400 tons and 500 horse power. Throughout her trip the engines worked with such smoothness that hardly any vibration was perceptible. Messrs. Luke and Miller, the Admiralty engineer and surveyor, were on board, also Mr. A. M. Weir, general manager of the company, and Mr. Robert Charles Baldwin, the company's general superintendent.

The fine screw corvette, *Orpheus*, 21 guns, was launched at Chatham in the early part of last month with complete success. This is the third vessel completed and launched from Chatham dockyard during a very short period. The *Orpheus*, although inferior in point of size and tonnage to many of the noble line-of-battle and other ships recently launched and now in progress at Chatham is, nevertheless, a fine specimen of the modern class of 21 gun screw corvettes, and her symmetrical proportions and fine outline, viewed as she lay on the stocks before the launch, excited very general admiration. As regards her architectural design and build, it may be stated that she has been little more than two years in progress, her keel having been commenced on the 12th of May, 1858. She has been constructed from the designs of Admiral Sir Baldwin W. Walker, K.C.B., Surveyor of the Navy, under the Superintendence of Mr. O. W. Lang, the master shipwright, and his assistants. The following are her dimensions:—Length, extreme, 226 ft. 6 in.; length between perpendiculars, 197 ft. 2⅜ in.; breadth, extreme, 40 ft. 8 in.; breadth for tonnage, 40 ft. 4 in.; breadth, moulded, 39 ft. 8 in.; depth in hold, 24 ft. 2 in.; burden, in tons, 1705 55-94. She is to be furnished with a very heavy armament, and is pierced to carry 21 guns, which will be thus disposed:—20 8-inch guns on the maindeck, each of 60 cwt., and 8 ft. 10 in. in length; and one 68-pounder pivot gun, of 95 cwt. and 10 ft. in length. Her propelling power will consist of a pair of 400 horse power (nominal), trunk engines, by Messrs. Humphreys and Co. She is to be immediately fitted with her machinery, and prepared for service.

The trial of the noble screw three-decker, *Victoria*, 121 guns, concluded July 5, and was attended with perfect success. The huge mastless vessel steamed out of Portsmouth harbour at half-speed at 11 A.M., in charge of Capt. George T. Gordon, commanding the steam reserve. On clearing the narrow harbour channel the speed of the ship was increased until nearing the Warner Light-vessel, when full speed was put on, and the ship's head afterwards brought round and directed towards the trial ground in Stokes-bay. Much interest has been felt as to the results of the *Victoria's* screw trial, from the power of her engines—1000 horse nominal; and also from the probability of her being the last three-decked ship which will be built in Portsmouth dockyard. The ship's draught of water was—forward, 18ft. 7in.; and aft, 23ft 11in., The weather was all that could be desired for the purpose of testing the steaming powers of the ship at her present light draught of water, which when she has all her weights and crew on board, ready for sea, will be increased by nearly five feet. Six runs were made at the measured mile, with and against the tide, with the following results:—1st run, 13·533; 2d run, 12·631; 3d run, 14·063; 4th run, 11·803; 5th run, 14·694; and 6th run, 11·323, given a mean of 13·129 knots per hour. The ponderous machinery worked well in every part, and there was a plentiful supply of steam. Steam pressure was 20lb.; vacuum, 21lb.; revolutions of engines, mean, 60; diameter of screw, 20 feet, with 25 feet pitch. The screw is Messrs. Maudslay's adaptation of the common screw with their shifting pitch, removeable and the leading corners cut off. At the conclusion of the sixth run the ship was again steamed out for the Warner Light ship, on reaching which her helm was put hard a-port, and she made a complete circle in 4½ minutes. Great difficulty was, however, found in steering the *Victoria*, as in all other full-powered screw ships, as, with even eight men at the wheel when under full steam, only 1¾ turn could be got to port and two to starboard. The immense pressure brought to bear on the rudder by the action of the screw, it is well known, causes this; still the fact remains the same, and the safety and efficiency of our high-powered ships of war are thereby considerably imperilled. The speed obtained by the *Victoria* is in advance of any yet obtained by a line-of-battle ship, and the results, so far, may be considered quite satisfactory. She is fitted with Suffield's patent engine-room telegraph. The stokeholes of the ship are—forward, 54 feet in length, and containing 20 fires. The after stockhole is 26 feet in length, and contains 12 fires. The engine-room is 31 feet long. Total length of ship's hold occupied by engine-room and stokeholes, 111 feet. The *Victoria*, at the close of the trial, was brought into harbour and berthed alongside the *Duke of Wellington*, at the upper part of the harbour. From the manner in which everything on her upper deck is being housed in, there seems no probability of this fine ship being commissioned at present.

Shipbuilding at Sunderland.—It will be learned with regret that the timber shipbuilding trade of Sunderland has seriously fallen off during the last year or two. The tonnage turned out last year was only 34,681 tons, as compared with 68,479 tons in 1853. The tonnage turned out at other ports exhibits a small but not very satisfactory increase, having been 95,432 tons last year, and 81,206 tons in 1853. The diminution in the tonnage at Sunderland is attributed to the unhappy disputes between the shipwrights and their employers, business having been taken away from that cause to more harmonious localities.

Iron in Lincolnshire.—The statements made with respect to the existence of iron in Lincolnshire, increase in interest and importance. In the neighbourhood of Caistor, ironstone bas been found in abundance, and also limestone, an essential element in the process of smelting. Borings to the depth of nearly 500 feet have also been made in the parish of St. Martin, Stamford, the result being the discovery of valuable beds of ironstone, pyrites, and coal.

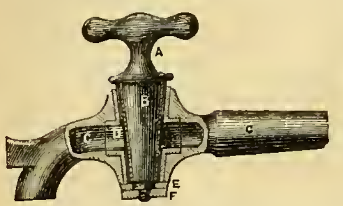
The Pig-Iron Trade.—The make of pig-iron in the Scotch district, in the quarter ended the 30th of June, has been very great. There are 131 furnaces in blast, and the production has been 277,000 tons, showing an increase of 35,000 tons as compared with the same period of 1859. The total deliveries, including the local consumption and exports, during the past quarter were 235,000 tons, being 5000 in advance of the corresponding quarter of 1859, but 5000 below the same period of 1857. Stocks have therefore increased during the quarter to the extent of 42,000 tons. They now amount to 340,000 tons, exclusive of carron. The augmentation of stocks is attributed to the unsettled aspect of the continental world.

The Manchester Association for the Prevention of Steam Boiler Explosions.—At the usual monthly meeting of the executive committee, held at their offices, Mr. H. W. Harman, C.E., chief inspector, presented his report, from which the following are extracts:—"We have made 173 visits, and examined 499 boilers and 363 engines. Of these, 12 visits have been special, 21 boilers specially, 11 internally, and 23 thoroughly examined. Ten cylinders have been indicated at ordinary visits. The general defects may be classified as under: fracture, 14 (four dangerous); corrosion, 30 (six dangerous); safety valves out of order, 39; water gauges, 37; pressure gauges, 8; feed apparatus, 2 (one dangerous); blow off cocks, 2; fusible plugs, 3; furnaces out of shape, 16; over pressure, 1; blistered plate, 3; total 155 (11 dangerous). Boilers without glass water gauges, 25; ditto pressure gauges, 19; ditto blow off cocks, 2; ditto back pressure valves, 45. As is usual, a number of minor defects have come under observation, and have had attention."

Grand Trunk Railway of Canada.—The total receipts on this line during the week ending June 16, for 12,734 local passengers, amounted to 18,379 dols.; for 2414 foreign passengers, to 6307 dols.; for 308 emigrants, to 661 dols.; for mails, express, &c., to 3130 dols.; for local freight and live stock, to 16,862 dols.; for 2068 tons of timber and lumber, to 4044 dols; for 1590 tons of fire-wood, to 956 dols.; and for foreign freight and live stock, to 3748 dols.;—total, 54,105 dols. on 970 miles, against 37,301 dols. on 880 miles for the corresponding week of 1859, showing an increase of 16,804 dols., or 45 per cent. The increase in the receipts for local passengers amounted to 5745 dols.; for foreign passengers, to 2816 dols.; for emigrants, to 123 dols.; for mails and express, to 781 dols.; for local freight and live stock, to 5728 dols.; for timber and lumber, to 415 dols.; and for foreign freight and live stock, to 1777 dols.; but there was a decrease of 582 dols. in the receipts for firewood, as compared with the corresponding week of 1859. The total traffic receipts from the 1st July, 1859, to the 16th of June last, amounted to 2,807,286 dols.; and for the corresponding period of the preceding year, to 2,188,419, showing an increase of 618,867 dols., or $28\frac{1}{4}$ per cent.

Immigration into the West Indies.—Since 1848, 5557 immigrants have been introduced into Jamaica, 17,165 into Trinidad, 38,921 into British Guiana 1674 into St. Lucia, 895 into St. Vincent, 2034 into Grenada, 1213 into Antigua, 852 into St. Kitt's, and 292 into Tobago, making an aggregate of 68,603. The immigration has been derived from the following sources:—Darien, United States, 32; Great Britain, 22; Havannah, 276; Saba 23; Sierra Leone, 6543; Kroo Coast, 273; St. Helena, 7181; Rio de Janeiro, 619; Maderia, 12,670; Azores, 164; East Indies, 36,091; China, 2806; Cape Verds, 1198. Since 1848, no fewer than 192,992 immigrants have also been introduced into the great sugar producing colony of the Mauritius, nearly the whole of them (191,996,) having been drawn from the East Indies. The transport of the immigrants from the East to the West Indies has been attended with a rather heavy mortality. Of about $7\frac{1}{2}$ per cent. on the whole number of immigrants embarked, having died on the voyages, while in the case of British emigrants to Australia in 1856-7-8-9, the deaths were only about 1 per cent. The immigrants are engaged for five years, and are hired at a fixed sum of four dollars per month; but if on their arrival in the colonies they prefer to be paid by the day in the same way as non-contract labourers, the necessary alteration is made in their contracts, and they are placed on the same footing as to remuneration. The immigrants are provided with a free passage, and, if any one desires it, an advance of 20 dollars is made to him, repaid subsequently by deductions from his wages. Women, when they accompany their husbands, are left unfettered by any conditions.

Payne's Iron Taps.—Brass taps, on account of the intrinsic value of the metal, offer a particular inducement to dishonest persons to steal them, where they are placed in such a position as to admit of their being removed. The theft of these things, from unoccupied houses, frequently entails a serious loss on the owner. To remove this temptation, Messrs. Miles and Co., of the Patent Lock Works, Forest Hill, have undertaken the manufacture of Payne's patent iron taps. The accompanying figure is an elevation of the tap partially in section. The plug, A, is formed of malleable iron, the lower part of which is cased with the metal lining, B. The barrel of the cock, C, is of cast-iron, having fitted to it a metal lining at D, so as to form a water tight junction with the plug, A. At the lower end of the plug is a hollow washer, E, with an India-rubber ring inserted, and below this a nut, F, is screwed on to keep the plug in its place. The metal linings, B and D, are formed of anti-frictional alloys, the other portions of the tap are galvanized, so as not to rust when in use. For water-butts and similar exposed places it is just the thing, as it offers no temptation to theft.

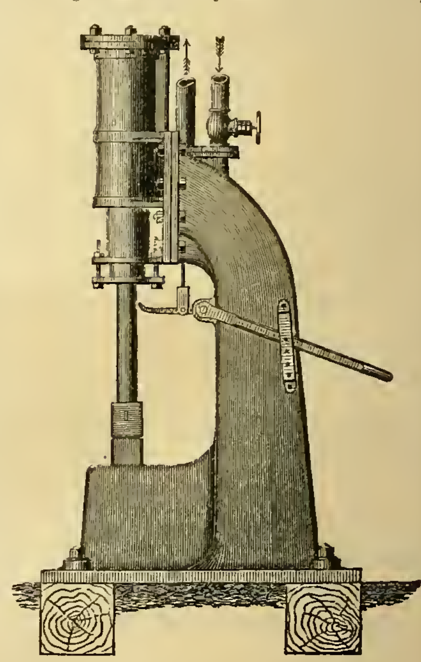


Emigration.—Since 1815 it is calculated that 4,920,574 persons have migrated from the British Isles. Of these 1,186,735 went to the North American colonies, 2,960,706 to the United States, 686,899 to the Australian group of colonies, and 86,234 to other places. The annual average from 1815 to 1859 was 109,347, and for the last ten years 248,958, so that of late emigration has proceeded in a greatly accelerated ratio. There can be no doubt that the excessive prices demanded for colonial land, have diverted the great bulk of our emigration to the United States. From 1815 to 1834 the emigration stream flowed more freely into British America than into the United States, the emigrants to the former regions having been 402,681, and to the latter 268,633, while from 1834 to the close of last year the emigration to Canada amounted to 784,054, and that to the United States to 2,692,073. It thus appears that Canada is not so attractive an emigration field now as it was thirty years since, the emigration thither having amounted to 6,689 last year, and to 13,307 in 1829, while the total emigration was 120,432 last year, and only 31,198 in 1829. The emigration to Australia also shows the disastrous policy of charging £1 per acre for land 15,000 miles from Great Britain, while it is to be had in the United States at 5s. per acre, 3,000 miles off. Thus the emigration to Australia reached a total of 32,625 in 1841, and in the following year, when the £1 an acre was first insisted on, it fell to 8,534, in 1843 to 3,478, in 1844 to 2,229, and in 1845 to 830! The depression of agriculture at home again forced up the figures to 32,191 in 1849 and 16,037 in 1850, and the gold discoveries have since largely increased the emigration.

The Rocky Mountains.—Several passes across the Rocky Mountains within the British territory were discovered by the exploring parties under Captain Palliser and Dr. Hector; and after partially exploring the country to the west of those mountains without any practical result, the expedition returned. During the whole time magnetical and astronomical observations were continually made by the scientific gentlemen of the party. Dr. Hector reports unfavourably as to the availability of the extensive region of the Saskatchewan for colonisation, and as to a communication through the British territories with the Pacific. The valley of the Saskatchewan extends over an area of 155,000 square miles, of which about 61,000 square miles are capable of cultivation, one-third part of it without any previous preparation of clearing; but the access to it from Lake Superior is so difficult, that it would prevent any British colonists from settling there whilst land equally good is to be found in Canada. Between Lake Superior and Lake Winipeg six changes of the mode of transit, by land and by water, are at present necessary. The passes across the Rocky Mountains are not now practicable for traffic, and the extensive tract of country between these mountains and the ridge of rocks that extends along the shores of the Pacific presents a serious obstacle to communication. The valley of the Saskatchewan is thought to be only accessible for traffic through the territory of the United States, and to find a practicable means of communication between the east and west coasts of North America, it will be requisite to cross the boundary line both north and south. It is said, however, that there is a more practicable pass over the Rocky Mountains than those mentioned by Captain Palliser and Dr. Hector, through which the Peace river flows from east to west.

The Coal Trade.—During the month of June the total quantity of coal and coke exported from the various coal ports of Great Britain was, of coal 637,207 tons, and of coke 19,191 tons. Of this quantity, which shows a considerable falling off from the exports of the preceding month, Newcastle exported 169,194 tons of coal, and 5974 tons of coke; Blyth, 9591 tons of coal; Sunderland, 107,505 tons of coal, and 1434 tons of coke; Hartlepool and West Hartlepool, 57,862 tons of coal, and 3903 tons of coke; Middlesborough, 12,193 tons of coal, and 2352 tons of coke; Hull, 13,701 tons of coal; Liverpool, 73,666 tons of coal, and 2921 tons of coke; Cardiff, 76,801 tons of coal, and 292 tons of coke; Swansea, 24,882 tons of coal, and 305 tons of coke; Newport, 15,846 tons of coal, and 112 tons of coke; Llanelly, 6875 tons of coal, and 1463 tons of coke; Grangemouth, 6442 tons of coal, and 64 tons of coke; Alloa, 4881 tons of coal; Charlestown, 6946 tons, and Troon, 10,190 tons of coal. The quantity of coal and coke shipped to London and other ports in the United Kingdom during the month was 827,692 tons of coal, and 3039 tons of coke, of which Newcastle shipped 188,867 tons of coal, and 1588 tons of coke; Sunderland, 150,146 tons of coal; Seaham Harbour, 57,585 tons of coal; Hartlepool and West Hartlepool, 106,438 tons of coal, and 231 tons of coke; Middlesborough, 20,180 tons of coal; Swansea, 13,281 tons of coal, and 4290 tons of culm; Cardiff, 64,347 tons of coal, and 1193 tons of coke; Newport, 45,191 tons of coal, and 27 tons of coke; Troon, 59,900 tons of coal; Maryport, 34,325 tons of coal; and Whitehaven, 16,478 tons of coal, and 167 tons of culm. The number of vessels engaged in the trade was 7282, of which 4672 were engaged in the home and 2610 in the over-sea coal trade.

Rigby's Steam Hammer.—This is an exceedingly compact and useful form of steam hammer, which is now being made for sale by Messrs. Glen and Ross, of Glasgow, engineers. The subjoined engraving represents a side elevation of the tool. The column, sole-plate, and anvil block, are cast in one piece, thus making the hammer very portable; and the only foundations required are two short logs, as shown in the illustration. The valve is so arranged, that full pressure of steam is admitted at pleasure on the upper side of the piston, thereby giving blows equal to four or five times the weight of the hammer bar when falling by gravity alone. The hammer works with great rapidity, at a steam pressure of from 20 to 25 lbs.; and a boy may learn to work it with precision in a day or two.



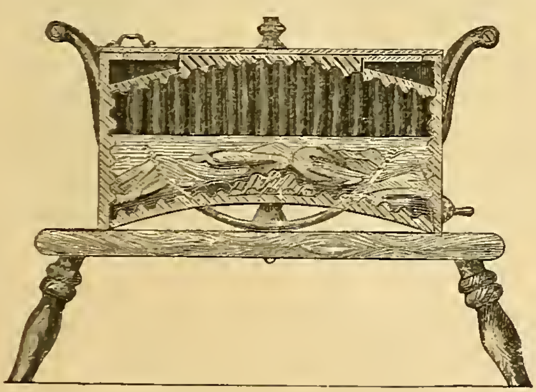
This hammer is specially designed for general smiths' work of a light description. The piston and piston rod are of malleable iron, in one piece which weighs about 260 lbs., and has a fall of 20 inches; the hammer face is also of malleable iron, steeled.

The arrangement of the whole is good, and the hammer does its work in a very satisfactory manner.

British Columbia.—The population of whites in this colony amounts to 5,000, consisting almost entirely of men, the women and children being very few. The townspeople are reported to be well conducted, crimes being rare. The export of gold is estimated at about £14,000 a month, exclusive of that in the hands of the miners. An export duty is in contemplation. The gold searching is principally carried on by "sluicing," which is effected by means of ditches, constructed with great skill, and sometimes of great length, one of them being five miles long, through a very difficult country. A "free miner" has to take out annually a 20s. license from the Gold Commissioner of the district; a "claim" must be registered at a charge of 4s. a year. The free miners in a district may procure the establishment of an elective "mining board," to make bye-laws concerning mining matters. The Gold Commissioner is a magistrate, with power to try all mining disputes, but subject to an appeal in cases of importance. The Governor reports that the land on the banks of the Frazer river, which rises in successive terraces, evidently the former bed of the river, is everywhere highly auriferous, and 71 ounces of gold-dust have been taken out of a "claim" by three men in 24 hours; gold has been discovered as far as the Frazer has been prospected, which is 600 miles from its mouth; and on the Quesnel river, a tributary, £40 a day is said to have been made "to the hand." Roads are being opened by the sappers and miners, and the expense of transport has been reduced from 37 cents per lb. to 10. The great drawback is the absence of an agricultural class; but every encouragement is given to settlers, and they are allowed to occupy unsurveyed land (160 acres) with a future right of purchase at an upset price of 10s. an acre (reserving the precious minerals). Aliens who have been *bona fide* resident for three years may be naturalised.

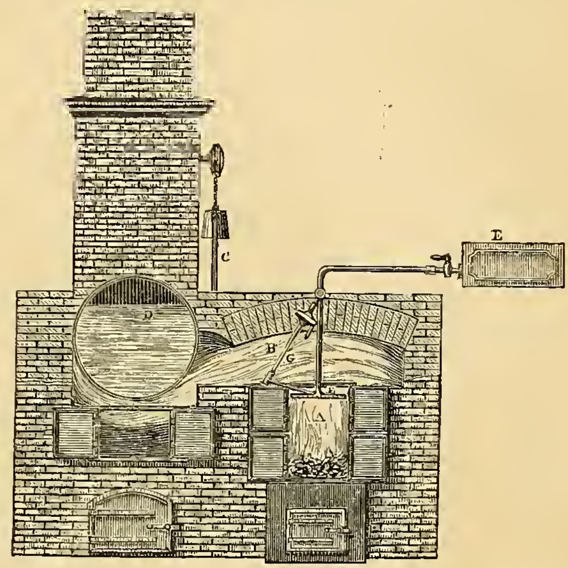
Communications by Telegraph Abroad.—The third and final report of the select committee on Government packet and telegraphic contracts, has just appeared. They say that they are strongly convinced of the very great importance of our having independent means of telegraphic communication, free from all foreign supervision or control, with our stations in the Mediterranean and our empire in the east. The continental lines are subject to the supervision of the police and the control of the Governments through whose territories they pass. The committee advise that the British Government should keep free from any obligations or understandings which may in any way fetter their action in regard to after proceedings or other lines; and that all contracts be effectually brought under the notice and control of Parliament. The telegraphic contracts as yet made by the Government are six in number. Three guarantees have been given to three companies for 25 years, but conditionally on success, and to be operative only while the telegraph is in working order. To the Atlantic Telegraph Company a return of 8 per cent. is thus guaranteed on a capital of £600,000, but this has been found insufficient to enable the company to raise the required capital, and the scheme is now in abeyance; to the Mediterranean Extension (Island of Sardinia to Malta and Corfu) 6 per cent. on £120,000, but failures have occurred which have interrupted the working of the line; to the Channel Islands Telegraph 6 per cent. on £30,000, and the full guarantee has to be paid by the Government, for a 30 years' monopoly held by a British company from the Government of France prevents this cable being employed for messages beyond the Channel Islands in connection with the French telegraphs. The Ragusa and Alexandria telegraph is to be made by the Austrian Government and leased to a company, and the British Government guarantee 3 per cent. for 25 years on a capital of £500,000, when the line is in working order. To the Red Sea and India Telegraph Company (Alexandria to Kurrachee) the Government have given an absolute guarantee of $4\frac{1}{2}$ per cent. for 50 years on £800,000 or £1,000,000. Lastly, the late Government determined themselves to construct and lay a cable from Falmouth to Gibraltar, with a view to extending it to Alexandria, so as to have an independent line of our own from England to India. The present Government propose, however, to transfer that cable to India and lay it down to Singapore.

Bogg's Washing Machine. — The accompanying illustrative engraving represents an elevation partially in section, of a washing machine, for which Mr. M. Bogg, of Duggleby, near Malton, in Yorkshire, has obtained letters patent. The machine consists of a rectangular trough or vessel, which is supported upon a wooden frame. The washing vessel has secured to it at each end a segmentally shaped rocker, the extremities of which are curved, so as to come



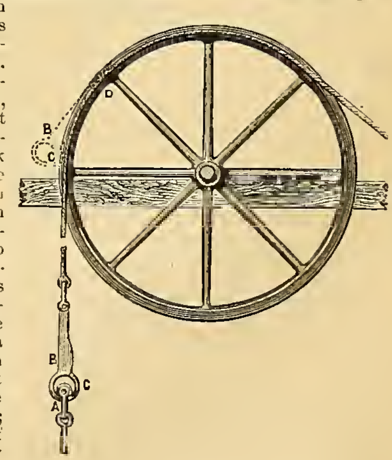
in contact with stops on the frame, and prevent the washing vessel from tilting over too far. The washing trough thus rests upon the convex faces of the rockers, and is readily moved with a rocking motion, by means of the projecting handles at the sides. The inner surface of the washing vessel is corrugated, so as to form an undulating surface, and in some cases there is fitted to the curved bottom of the vessel a bridge piece, as shown in the figure. At the upper part of the vessel the corrugated sides are prolonged inwards, which prevents the water from being thrown out when the machine is put in motion. A lid is fitted to the upper part, in the centre of which is an opening to admit of the escape of steam. The vessel being charged with a sufficient quantity of water and soap, the clothes are immersed therein. Upon the vessel being put in motion, the friction of the clothes against the undulating surfaces rubs them so as to speedily cleanse them from dirt, with a very small expenditure of labour.

Davis' Breeze Oven.—This is an economical arrangement of a small coke or breeze oven, by Mr. J. Davis, of Lichfield Street, Birmingham. Our illustrative figure is a partially sectional elevation showing the construction of the oven arranged at the side of a boiler. The oven may be placed on either side, or in front of the steam boiler, and communicate with the boiler by the flue, C. By the damper, D, the flue may be closed. The flame from the oven passing under the boiler, renders it only necessary to have a small fire under the boiler, or in the tubes, as the case may be, which may be supplied by the slack, or dross, taken out by means of a screen or riddle about $\frac{3}{8}$ or $\frac{1}{2}$ inch mesh, which is generally about one fourth of the ordinary engine slack or dross, the remaining quantity is put in the oven in thin layers, until it becomes full, the same as in the ordinary way of firing the boiler. The contents come out of the oven in the shape of breezes (or chars), of superior quality, and suitable for any smithing purposes. These breezes are worth as much as the whole cost of the slack or dross was before it was divided, besides getting the whole of the steam, the flame from the oven being delivered under the boiler or through the tubes, prevents the formation of smoke. The oven may also be applied to furnaces for heating boiler plate, angle iron, stoves, annealing ovens, and for heating air for blast furnaces, or for any other purpose where heat is required, and being simply an addition, does not involve the pulling down or alteration of existing



boilers or furnaces, or cause any delay. When the oven is required to be drawn the breezes are cooled inside by means of the water pipe, E, which may be attached to a convenient supply, and goes 18 inches into the oven, cooling the breezes gradually without damaging the oven. The water being injected through a quantity of small holes in the cross pipe, only falls on the breezes as the man rakes them from the back to the front of the oven. These breezes (or chars) are found to be of superior quality, being perfectly free from sulphur which usually contaminates the ordinary breezes. By the use of this invention, manufacturers who use breezes (or chars) will effect a great saving, as the heat from the ovens hitherto lost, is frequently enough to work the steam boilers of the establishment besides effecting the burning or consuming of smoke.

Self-Acting Disengaging Hook.—The frequency and fatal consequences of accidents arising from over winding or drawing the cage over the head gear pulley, have called the attention of colliery owners and inspectors to the means whereby such accidents may be avoided in future. The annexed engraving represents a self-acting spring hook, the invention of Mr. Robert Walker, of Eccleston, near Prescot, colliery viewer. This hook possesses all the qualities requisite to ensure its general application in coal and other mines. When this hook is employed, it is impossible to wind the cage up sufficiently high to cause an accident. The mode of action is as follows:—When the cage is rising, the bridle, A, hangs in the hook, B, which is made with a spring catch, C. This catch closes the hook entirely, so that there is no possibility of the cage becoming disengaged in winding; but if, owing to the neglect of the engine driver or from any other cause, the cage should be raised until the hook comes against the head gear pulley, D, as shown by the dotted lines, then the hook assumes a diagonal position, and the bridle, A, bearing upon the spring catch, C, causes it to open and to disengage the cage from the hook. When the cage is disengaged it is caught by retaining pawls or other apparatus, to prevent it descending the pit.

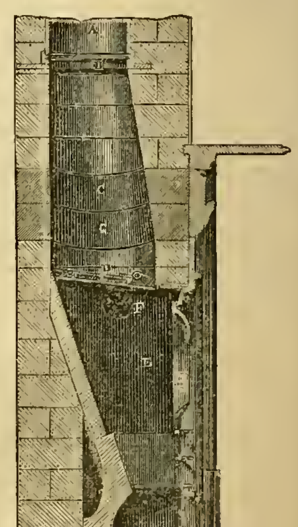


Scientific Enquiry.—If the history of almost any scientific investigation were fully made known it would generally appear that the stability and completeness of the conclusions finally arrived at had only been attained after many modifications, or even entire alterations of doctrine.—*Dr. W. B. Carpenter.*

Factory Inspectors' Reports.—From the lately published reports of these gentlemen, we learn that the operatives have had good reason to be content. Wages for 60 hours a-week are higher than they were 20 years ago for 69, though it happens, singularly enough, that it is not so in somewhat analogous occupations in which the labour of women and children is unrestricted, such as printing, bleaching, and dyeing-works. New mills are springing up and hands have been scarce, so that a good deal of machinery has stood still for want of them, and workpeople have been engaged from other parts of the kingdom, among them children of 13 from workhouses, though this is high-priced labour, because the manufacturer has to lodge, clothe, and feed, as well as to some extent remunerate the children. In some of the cotton districts a revival of the old domestic system of manufacture is noticed as frequent in weaving-sheds, the operatives hiring and working looms, and their families working with them. But the most remarkable circumstance is the rising importance of co-operative societies, stimulated partly by the passing of the Limited Liability Act, and partly by the extraordinary success of a company formed at Rochdale 12 years ago, with a large paid-up capital, now increased to £60,000, in £12 10s. shares, and which paid a dividend of 44 per cent. in October, and of 48 per cent. in the spring of this year. The great majority of the shareholders are operatives who work for wages in the factory, having nothing to do with the management, except giving their votes at the annual election of the committee of management. The system is now spreading, and several joint-stock companies have been formed; it is stated that in Bury alone upwards of £300,000 will be required to put into working order the co-operative mills there built and building. Such a profitable investment for small savings, will be a strong inducement for many a man to save, and, we trust, will have important consequences. Passing to the wool trade, we learn that this has not been so much affected as the cotton trade by scarcity of hands, because improved machinery has made it less dependent upon manual labour; but there is a great scarcity of the raw material, and the death of many sheep from bad food in the winter must make the new clip more inadequate than usual. The silk trade has been very much checked during the last few months, and the greatest fears are entertained of French competition, but it is hoped that such a spirit of activity and energy will be aroused by this competition that it may lead to a success which could not have been expected under the old condition of things. The tendency to enlist steam power in the service of the domestic system of manufacture continues, and the cottage silk factories of Coventry are increasing considerably. The inspector of the district, Mr. Baker, maintains that it only wants a better estimate of the power of savings to enable the English workman to overcome all difficulties. He remarks that, though it is but 12 years since the riband weavers separated themselves from the congregated labour of the factories, there is said to be almost as much difference now between the work done upon the weaver's loom and that done upon the master's as there is between the French riband and the English. If the design, or colour, or fabric of the English riband is not as chaste, or clear, or exquisite as the French, can it not be made so? If the present be a crisis in the silk trade, it should stimulate the workman not to give in to the superiority of the French, but strive to improve as he has been doing during the last 12 years; and then instead of asking for protection in order to compel the use of an inferior article, he will take his own place without any intervention.

Stave Dressing Machinery.—Some improved mechanical arrangements for cutting and dressing staves has been recently put into practice by the inventor, Mr. Colin Mackenzie, of Stornoway. This machinery is adapted for the manufacture of casks, barrels, and other wooden vessels. In these mechanical contrivances, the cutters, with their appurtenances, and the bed upon which the staves slide, are so arranged and constructed that the operator can adjust and arrange all the parts necessary for dressing staves of different widths in the same barrel, with both a bulge and bevel proportionate to the width. The improvements also provide that in the same or a single machine correspondingly adjusted, staves for casks and barrels of all sizes and forms may be dressed, the staves being properly proportioned by the machine. The whole of the improvements embodied in this invention, with the exception of a V guide employed for guiding the stave being cut, refer to the arrangement and combination of parts, by which a variety of bulges, bevels, and cuts off the side of the staves can be made of uniformly accurate proportion, and the staves thus suitably prepared at once to suit the work required. In this way the same machinery is adjustable to suit all kinds of cut required for large or small, narrow or wide staves. The machine consists of an open rectangular cast-iron frame, on which are disposed the whole of the operating parts for dressing and otherwise treating staves. The first motion belt pulley shaft is in connection with a pair of horizontal rotatory cutters, one above and one below the flat side of the stave being dressed. The same shaft also drives a cone pulley for the purpose of varying the feed, and an arrangement of toothed gear for working a set of frictional pressing rollers for guiding the staves as they pass through the machine. Other intermediate gearing conveys a movement to a shaft carrying a variable or adjustable cam, which cam gives motion to a pendent lever hung upon a stud in the framing, and terminating at that part in a broad plate. In this plate are slots for adjusting the connections which hold and operate the slide bearings, forming the bearings for the upper part of the vertical shafts, to which vertical cutters are attached. Attached to the variable cam is an adjustable cam which operates a stop by means of a lever, the object of the stop being to retain the stave from passing into the feed rolls until the proper moment. By the arrangement of the slots and connections, as the connections are moved within the slot, nearer the centre or fulcrum on which the pendent lever turns, proportionally less variations will be given to the vertical cutter shafts by the action of the lever and cam wheel, and consequently, a less bulge or more nearly straight stave will be produced, the variation being in all cases in a ratio to the distance of the adjustment on the connections from the said centre or fulcrum, the slots in which the change is made being set at an angle of forty-five degrees to the line of the connections. A variety of bulges may be produced by adjusting the variable cam by means of the screws provided for the purpose. To change the stave level to correspond with a different head diameter, another adjustment becomes necessary. There is an adjustable stud which represents the centre of the barrel, and the edges of the vertical cutters upon the shaft are inclined to this centre, so that by lowering or raising the stud the cutters are adjusted to dress the bevel of the stave to suit casks of a greater or less diameter. A difficulty has been experienced in keeping the stave in a direct line in its course through the machine; to provide for this difficulty there is inserted in the bed plate a V guide, beneath the pressure rollers, which effects the object in a very efficient manner. The cutters for dressing and curving the surfaces of the stave are of the ordinary construction, and may be varied in curve and cut in the ordinary manner. There is a tightening pulley which may be adjusted in any convenient manner.

Flue and Chimney Valve.—The subjoined figure is a vertical sectional elevation of an improved flue and chimney valve, the invention of Mr. E. A. Spurr, of Newton Road, Bayswater, architect. The invention is intended to remove the causes of that offensive nuisance, a smoky fireplace; and also to prevent the downward currents, which frequently brings the smoke from an adjoining flue, and pours it into the room through an unused fireplace, the register usually attached to ordinary grates being quite useless for this purpose owing to its imperfect fitting. To obviate this defect the chimney valve, D, is so contrived that a smoke-tight joint is made when it is closed, and should the soot accumulate so as to impede the action of the hinge, or the flanges, the large circular plate can be easily detached and the obstruction removed. This larger plate is to be taken out when the chimney is swept, the opening being made of a sufficient diameter to admit the brush of the machine. The flue, A, is formed of circular fire-clay tubes, jointed together with socket joints. The lower tube rests upon an iron bearing plate, B; below this the brickwork is formed into an arch, which is carried through the entire thickness of the wall. At the mouth or opening of the flue is arranged the valve, D, by means of which the chimney can be entirely closed up when required. Immediately below the valve a ventilating flue opens into the chimney, and this part, E, of the fireplace is lined with fire clay. In existing flues the construction is generally so imperfect, both as regards form and workmanship, that any contrivance for the cure of smoky chimnies has to contend with great difficulties, as any addition either to the bottom or the top of a flue cannot have a fair chance of success if the shaft itself be imperfect. Most flues depend on the pargetting, or plaster lining, for rendering them tolerably smooth and air tight, but a few applications of the sweeping machine partially destroys this lining, and the joints of the brickwork not being properly flushed up with mortar, the tube, instead of being impervious through its whole length, becomes perforated on all sides, and admits currents of air from adjoining flues, and even from the outsides, which are sometimes, but very rarely, made rather thicker than the weths or divisions. That part of the wall of the chimney next the room is also particularly liable to damage from the practice of joiners and others who drive plugs into the wall for the purpose of fixing their work, and frequently by so doing injure the inside of the flue and endanger the safety of the house. This chimney valve if applied to a flue of the old construction, and properly built in by filling up the gathering wings which are usually left vacant, and merely leaving a funnel shaped opening reaching from the plate to the commencement of the flue, will, in most cases, provided the upper portion of the chimney be in the ordinary state of repair, insure a constant upward current of warm air. In a new building in which this apparatus can be used in connection with fireplaces and flues constructed as shown in the accompanying engraving, its action becomes much more certain; in this arrangement the fireplace is formed by an arch (semicircular preferred) built the whole thickness of the wall, thereby greatly adding to the strength of the work, in the course of which a circular opening is made, and above that the flue is built in the usual way, but instead of the pargetting, fire-clay pipes, circular in figure, are built in as the work proceeds, and carried up, with luted joints, to the required height. The chimney valve plate may be built in at the proper height as the brickwork rises, or it may be inserted afterwards as in the case of an old flue, and it can be adapted to an iron stove of ordinary construction by making the back part of the stove a fixture and screwing up the front, or, a fire-clay back of any convenient shape may be fixed instead of the iron one. The chimney valve, &c., is made as simply as possible, in order to reduce the expense, and cause it to be used by builders of common dwelling-houses. One or two somewhat similar inventions have been partially used in large and costly buildings, but their expense prevents the use of them generally, and they do not possess the advantages of this more simple arrangement, their action being confined to the down draught only, the large cold air reservoir at the bottom



of the flue remaining unaltered; indeed, in one case, this evil is actually increased. A different mode of finishing the top of the chimney is desirable, both for architectural appearance and to prevent the wind in its passage from blowing down the flue. Instead of the ugly, and worse than useless, pots, pipes, and cowls so commonly used, the wall containing the flues, when it rises above the level of the roof, instead of being carried along in a horizontal line, and surmounted by the above-mentioned deformities, should be divided into separate shafts, one for each flue, and the top finished with a bevelled or sloping surface, without any level surface at the top of the flue, the wind will then pass freely between and over the chimnies without meeting the resistance and forming the eddies caused by the usual mode of building them. If the square shafts be set diagonally, the improvements would be still greater, but this would require a thicker wall and more space longitudinally than is at the disposal of the builder in ordinary cases. The chimney valves and tubular flues have been experimentally tried in some houses erected in Norfolk Square, Paddington, some of which have been occupied for some time, and, although the stoves were of various patterns, and were rather roughly fitted to receive the valves, the chimnies also being a novelty to the workmen, did not present the most favourable condition for success; yet, they appear to have a decidedly beneficial effect.

Sulphur Mines in Sicily.—The following account of certain sulphur mines in the centre of Sicily, and of the process of smelting was lately given in a letter of the *Times* special correspondent:—"The Monte S. Giuliano, on one of the slopes of which the town of Caltanisetta is built, has altogether the appearance of the cone of an extinct volcano, and in its spurs are found those almost inexhaustible sulphur mines which supply the whole of Europe; Villarosa, S. Cataldo. Terra di Falco are among the richest. The operation of mining and purifying is one of the simplest and least expensive. The sulphur lies embedded in tufa, gypsum, or limestone, especially in the latter, which, on account of its porous surface, worked upon by water, is called *briglia* or honeycomb. This formation serves as the usual index of the existence of sulphur, which is invariably found at a little distance in the side of the mountains. I have not seen any signs of water, and am told that it never occurs. This facilitates the operation; besides this, the stone is hard enough not to require any vaulting or support. Generally the thickness of the vein is just sufficient to stand the excavation; if it be an unusually rich vein, pillars are left. In fact, the operation is as simple as possible, and hence not expensive.

For smelting, formerly open platforms were used, but it was found that the sulphur got so impregnated with oxygen that it came out in an impure and inferior quality, besides which the neighbouring fields suffered likewise great injury. In order to obviate this, closed furnaces are now used. A round space, about 60 feet in diameter, is excavated in the side of a mountain, presenting a rapid slope, so that while the upper part of the wall does not exceed 8 ft. to 10 ft. in height, the lower is fully 20 ft. to 25 ft. This is done to facilitate the flowing down of the liquefied sulphur towards the orifice of the furnace. The orifice itself is built up of loose limestone, and plastered over outside, leaving only two or three little holes of a quarter of an inch to test the readiness. In the space thus excavated and well swept the sulphur-stone is laid in regular layers, but so as to leave a little space between it and the sides of the excavation. Not only is the whole excavation filled up, but, besides this, a regular pyramid is built up beyond, the height of which is regulated by the diameter of the excavation. When the desired height is obtained, the whole is covered up with slake which has been cleared out from former smeltings. Three or four holes, supported by stones, are left on the side opposite to the orifice, and from this the fire is applied. The richer the stone the easier is the process of burning. With some a lucifer match is sufficient to produce combustion. It takes from eighteen to twenty days to produce this result in the whole furnace. A person watches day and night before the orifice, decorated with a good number of pictures of saints, and probes from time to time. When the liquefaction has taken place, the oil, as it is called, runs out black, like pitch, but almost odourless, and is let into troughs marked with the cypher of the owner, where it cools in a short time, assuming a more or less bright yellow colour, according to its richness and purity. All this is simple, and, above all, inexpensive. The expense begins with the transport. Very few of the mines have roads leading to them practicable for carts; these mines are usually low and the ground heavy in winter. The first transport, therefore from the mines takes place on mules up to the first town in the neighbourhood; from there the sulphur goes in the two-wheeled cars of the country. They carry six mule loads, and get 12 taris, or about 5s. a-day, the return journey being paid at the same rate. Thus one cartload to Girgenti takes 12s. for a load of 6 cwt., yet in spite of this immense profits are realised, especially now, when the price is just double what it is usually. The transport to the magazines on the seashore is at the expense of the proprietors; many of these latter sell their produce directly abroad, and send it to Marseilles, Genoa, or Leghorn; others sell it on the spot, some of them clearing £20,000 and more a-year. The wonder to me is what they do with their money, for they live in a very primitive style, except the few who inhabit Palermo. It is somewhat explained by the circumstance that even at the most critical moment the funds were far above par, at 115 to 116."

Mistakes Inevitable.—If we trace the history of any science we shall find it a record of mistakes and misconceptions, a narrative of misdirected and often fruitless efforts. Yet, if amidst all these the science has made a progress, the struggle through which it has passed, far from evincing that the human mind is prone to error rather than to truth, furnishes a decisive proof of the contrary, and an illustration of the fact, that in the actual condition of humanity mistakes are the necessary instruments by which truth is brought to light, or, at least, indispensable conditions of the process.—*Samuel Bailey.*

The Diamond.—The geographical distribution and geological association of the diamond have not as yet thrown much light on its origin. In India Malacca, Borneo, in Brazil, Mexico, the gold states of the United States, and in the Urals, it is found in beds of rivers or alluvial deposits. In Australia and in Algiers it is reported to have been found, and under similar conditions. In Brazil it has been traced to its rock home in the itacolumite (a micaceous quartzose schist, often containing talbose minerals, and intersected by quartz veins), and also in a hornblende slate continuous with the itacolumite. But whether these are its parent rocks, or whether—as they are probably metamorphic in their nature—its origin dates from an earlier state of the materials that have become transmuted by time and the play of chemical and physical forces into itacolumite and hornblende slate, we are not in a position to declare. The companions of the diamond do not tell its history in a much less vague language. Gold seems in every diamond country to be either an associate or the not distant neighbour of the diamonds. Tourmaline, chrysoberyl, chrysolite, topaz, kyanite, oxydes of titanium and of iron quartz as jasper, and in other forms, are frequenely found with them. In the diamond, splinters of ferruginous quartz have been found. A high antiquity and an origin perhaps contemporaneous, and not improbably connected with the geological distribution of gold in quartz veins, may be inferred from these facts. The chemist has to deal with a more general problem; that of the methods, whether employed by nature or open to his own ingenuity, for producing the diamond. Many solutions for this problem have been and may be proposed:—1. The authority of Liebig supports the view of a process of eremacausis having converted organic compounds into diamonds. 2. The decomposition of binary carbon compounds by replacement of the carbon by some other elements. 3. A process of sublimation. 4. Cooling from fusion under pressure (supposing carbon otherwise to vaporise without fusion, like arsenic). 5. Deposits from voltaic currents between carbon poles. 6. Deposits on the cooling of fused metals (or other substances?) surcharged with carbon. 7. The separation of carbon from carbonates, analogous to that of silicon from silicates, which may be effected by magnesium at a red heat, and by lithium far under red heat. And these do not exhaust the number of possible suggestions. of them one (the sixth) possesses peculiar interest. Graphitic carbon and silicon are formed by the cooling of fused aluminium, surcharged with these elements; and the same elements—in other respects so closely grouped with carbon—separate in the adamantine form from zinc, under analogous circumstances. The latter are crystallised indeed in different systems from diamond, but they possess many of its characters in a remarkable degree.

Nile Exploration.—Mr. Consul Petherick has proposed three schemes, according to the amount subscribed, for carrying on the explorations. The first one, which would require £2000, would be conducted by himself, accompanied by a party of twenty armed men, with whom he would proceed towards the Lake Nyanzi, in the interior of Africa, where he expected he should meet Captain Speke and his party, and be able to conduct them in safety through the hostile tribes on the north, whom it is feared will otherwise murder them. In the event of not meeting that party, Mr. Petherick would continue the exploration with the view of tracing the sources of the Nile. The second scheme merely contemplated the rescue of Captain Speke from the dangers he will be exposed to, by sending an armed party to meet him. This might be accomplished for £1000. The third scheme was on a still more extensive scale, and contemplated prolonged explorations in the interior of Africa, which might not terminate till the spring of 1863.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded March 24.

766. John Dale, Manchester, Lancashire—Improvements in the preparation of a colouring matter for dyeing textile materials and fabrics, and other substances.

Recorded March 29.

807. George Haseltine, and John A. Knight, Symond's Inn, Chancery Lane—Improvements in spring bed-bottoms.—(Communication from Philip Ulmer, New York.
814. John Dale, Manchester, Lancashire—Improvements in obtaining albumen, or analogous substances, for use with pigments in calico printing, and for other purposes.

Recorded March 30.

824. John Davies, and George Paine, Truro, Cornwall—Improvements in the manufacture of gun-powder.

Recorded April 18.

970. Germain Canouil, Curtain Road, Shoreditch—Improved compositions for priming percussion caps, and a machine or apparatus employed therein.

Recorded April 24.

1016. Joseph Holder, Scabes Castle, Brighton—Improvements in apparatus for consuming all noxious exhalations from drying ovens used for chemical and chemical manure works, and arising from such works, and from mixing decayed substances in strong acids.
1022. Edward Gatwood, Holmer, near Hereford—Improvements in fixing and securing the rails in cast-iron or other chairs at joints and intermediate places in permanent ways.

Recorded April 30.

1090. Hiram Hutchinson, Rue Richelieu, Paris—Improvements in the manufacture of goods coated with India-rubber and other gums, and in apparatus to be employed therein.—(Communication from Mr. Lorin Burt, Langlee.)

Recorded May 11.

1162. George Holcroft, Manchester, Lancashire—Certain improvements in the manufacture of iron.

Recorded May 12.

1180. Abraham Pullan, Fortie Cottage, New Cross, Thomas Cresswell, Ravensbourne Terrace, Lewisham, and Richard Longstaff, Mornington Road, New Cross, Kent—Improvements in steam generators, and in the means of, or apparatus for, superheating steam and in heating the feed water.

Recorded May 16.

1201. Domingos S. Agata, Lisbon, Portugal—An improved disinfectant.

Recorded May 17.

1214. Marc A. F. Mennons, Rue de l'Echiquier, Paris—An improved carriage brake or drag.—(Communication from Mr. J. L. Simon, Tocqueville, France.)

Recorded May 21.

1242. James Copcutt, Kirby Street, Hatton Garden—Improvements in manufacturing gas and carbon, or lampblack, in one or the same apparatus, and in the apparatus employed therein, and for means and apparatus for rendering the gas applicable for lighting of ships, lighthouses, mines, and all other places where gas can be used.

1244. Samuel Crompton and William Robertson, Manchester, Lancashire—A new mode of economising water passing through canals, when such water is used for dragging boats or otherwise.

Recorded May 25.

1296. Alfred Hubart and Victor Cantillon, Liege, Belgium—Improvements in the manufacturing of glass casks and barrels.

Recorded May 30.

1330. Thomas Gordon, King Street, Soho, Westminster—Improvements in inkstands.

Recorded June 4.

1366. Jean B. Pascal, Boulevart St. Martin, Paris—Improvements in obtaining motive power, and in apparatus for the same.

1368. Clovis Wateau, Marle Aisue, France—An improved apparatus for cooling beer and other liquids.

Recorded June 5.

1374. George Fletcher, Farnham Place, Southwark, Surrey—Improvements in the apparatus for regulating the draft in the tubes of multitubular boilers.—(Communication from Donald Skekel and Alexander Skekel, Demerara.)

1378. Antonio J. P. de Carvalho, Moorgate Street—Improvements in beams, applicable in the construction of bridges and other structures, and also for the floors and ceilings of houses.

Recorded June 6.

1384. Sigismund Schuhman and George Harrison, Burnley, Lancashire—Improvements in machinery or apparatus for spinning, doubling, and winding fibrous materials.

1385. Edward T. Hughes, Chancery Lane—Improvements in coating or plating the faces of printing type and stereotype plates.—(Communication from Joseph Corduan, New York, U. S.)

Recorded June 7.

1396. Thomas W. Miller, Her Majesty's Dockyard, Portsmouth—Improvements in boilers or steam generators.

Recorded June 8.

1410. George Kane, Dams Street, Dublin—The making or fabricating in wood, metal or other suitable substances, bedsteads capable of being collapsed into a convenient size and form for transport as personal luggage, and to be styled "Kane's portable folding bedstead."

1411. George T. Bousfield, Loughborough Park, Brixton, Surrey—Improvements in machinery for the manufacture of barbed and other needles for knitting and sewing.—(Communication from J. J. Greenough, Wall Street, New York.)

1412. Alexander A. Croll, Coleman Street—Improvements in the purification of gas.

1413. Georgs Mackenzie, Paisley, Renfrewshire—Improvements in machinery or apparatus for twisting and doubling yarns and threads.

1414. James Monks, Alton, Hants—Improvements in the rails and chairs of railways.

1415. Philippe Grimaldi, M.D., Teramo, Naples, and Great Prescott Street—Improvements in steam generators.

1416. George Joslin, Henry C. Joslin, and John Joslin, Colchester, Essex—Improvements in reaping machines.

1417. William E. Newton, Chancery Lane—Certain improvements in sewing machines.—(Communication from A. G. Allen, New York, U. S.)

1418. William Richardson, Moreton Place, Kentish Town Road—An improved method of joining and fixing together drain, water, or gas pipes made of burnt clay or other earthly vegetable or mineral matter, thereby rendering them air and water tight and preventing leakage.

Recorded June 9.

1419. Charles Stevens, Welbeck Street, Cavendish Square—Improvements in smoke consuming furnaces.—(Communication from Toni Fontenay, Grenoble, France.)

1420. Joseph Westwood, Tredegar House, Bow—Improvements in armour plates for iron ships and vessels, or forts, or batteries.

1421. Richard Matley, Manchester, Lancashire—Certain improvements in machinery or apparatus for printing woven fabrics.

1422. William E. Gedge, Wellington Street, Strand—Improved apparatus for separately collecting the divers metals of which minerals, ores, and their gangues are composed.—(Communication from Randal Cresswell, Rue Malher, Paris.)

1423. Charles Breese, Birmingham, Warwickshire—Improvements in metal bedsteads.

1424. Robert Romaine, Myddelton Square—Improvements in the construction of steam boilers and condensers.

1425. James Combe, Belfast, Ireland—Improvements in roving and slubbing frames, and in the means of transmitting power thereto, and to machinery generally.

Recorded June 11.

1426. Frederick C. Calvert, Charles Lowe, and Samuel Clift, Manchester, Lancashire—Improvements in the manufacture of colouring matters.

1427. William Johnson, Nailer Street, and Isaiah Adamson, Liverpool—Improvements in hydraulic or other like presses, and in the apparatus connected therewith, for extracting oils from seeds.

1429. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in governors or regulators for steam engines.—(Communication from Narcisse Duvoir, Paris.)

1430. Peter Salmon, Glasgow, Lanarkshire—Improvements in furnaces and in feeding steam boilers.

1431. Alexander T. Blakeley, Holywood, Down—An improvement in rolls or rolling mills.

1432. Hubert Sommelet, Paris—Certain improvements in the manufacture of scissors.

1433. Theophilus Redwood, Montague Street, Russell Square—Improvements in the manufacture of paper.

Recorded June 12.

1434. Jabez B. Farrar and Joshua Farrar, Halifax, Yorkshire—Improvements in machinery or apparatus for spinning and doubling, or twisting wool, mohair, alpaca, cotton, silk, flax, or other fibrous substances.

1435. John Clarke, Heaton Norris, Lancashire—An improved registering apparatus applicable to gauges for steam, water, vacuum, heat, and similar purposes, and also an improved mode of weighting or balancing the ordinary index finger of gauges.

1436. Thomas C. Yates, Strangeways, Manchester, Lancashire—The manufacture of adjustable spikes for attaching to shoes or other coverings for the feet.

1437. Thomas Willis, and George Chell, Longsight, Manchester, Lancashire—Improvements in machinery for twisting, doubling, and winding yarn and thread.

1438. Robert Hyde, Kirby, Leicester—Improvements in apparatus for draining stables.

1439. Philippe Fromont, Chatelinau, Hainaut, Belgium—Improvements in machinery for the ascending and descending in pits or mines of workmen, waggons, carriages, and materials.

1440. Casper Loewenstein, Crutched Friars—Improvements in arrangements for paying out submarine cables.

1441. George Burrows, Nottingham—Improvements in the manufacture of figured lace made on bobbin net machines.

1442. Alfred V. Newton, Chancery Lane—An improved carriage ventilator.—(Communication from Asa Hopgood, Worcester, Massachusetts, U. S.)

1443. George Catlin, Manchester—Improvements in the construction of ships and other floating bodies.

1444. George Firmin and Cornelius Firmin, Ipswich, Suffolkshire—Improvements in the manufacture of sacking, and in apparatus for the same.

Recorded June 13.

1445. Jacques H. Thierry, Paris—Improvements in the manufacture and composition of ink for printing.

1446. Louis Pelissier, Bordeaux, France—An improved apparatus for lifting and moving blocks of stons or other heavy materials or loads.

1447. John Lancaster, Garden Farm, Dunmurry, Belfast—Improvements in whet stones, commonly called scythe stones.

1448. William Spence, Chancery Lane—Improvements in the mode of and apparatus for reducing silicious substances to a fluid state.—(Communication from George E. Vanderburgh, New York, U. S.)

1449. William Weston, Camden Town, and Benjamin Price, Mile End—Improvements in ovens for baking.

1450. George H. Chatwin, Gresham Street—An improvement in the ribs of parasols and other like articles.

1451. Alfred V. Newton, Chancery Lane—An improved construction of weighing machines.—(Communication from S. E. Robins, Boston, U. S.)

1452. John J. Bowen, Great Dover Street, Southwark, Surrey—Improvements in soldering irons heated by gas.

Recorded June 14.

1453. Gaetano Delauretis, Frith Street, Soho Square—An improvement in preventing and detecting forgery or alteration of figures in cheques, bank notes, drafts, bills of exchange, promissory notes, and other monetary bills.

1454. Michael Henry, Fleet Street—Improvements in treating vegetable substances so as to obtain paper-pulp, and other useful products.—(Communication from Louis H. Obert, Jean B. Vasseur, and Auguste Houbigant, Boulevard St. Martin, Paris.)

1455. Isaac Whitesmith and James Steven, Glasgow—Improvements in looms for weaving.

1456. Edward Sparkhall, Cheapside—Improvements in producing certain designs and patterns upon cloth or textile fabrics, in order to procure certain effects in garments made therefrom.

Recorded June 15.

1457. John Dooley and James Mawson, Dukinfield, Cheshire—An improved equilibrium slide valve, applicable to engines worked by steam, or other motive power.

1459. George Davies, Serle Street, Lincoln's Inn—An improved life-preserving mattress.—(Communication from Louis Bauhœfer, Philadelphia, U. S.)

1460. Isaac Mackrow, Woodstock Road, Poplar—Improvements in alarum locks and latches.

1461. James West, Birmingham, Warwickshire—An improvement in the bowls or rollers of castors for furniture.

1462. Cowper P. Coles, United Service Club, Pall Mall—Improvements in iron-cased ships of war.

1463. Richard A. Brooman, Fleet Street—Improvements in desiccating substances, and in neutralising or retaining any fœtid gases which may be evolved in the process.—(Communication from Messieurs Lege and Danguy, Paris.)

1464. William Harding, Rutland Terrace, Forest Hill, Kent—Improvements in breech-loading fire-arms.

Recorded June 16.

1465. Charles Coates, Sunnyside, near Rawtenstall, Lancashire—Improvements in the construction of breaks for carriages.

1466. Myer Myers, Maurice Myers, and William Hill, Birmingham, Warwickshire—Certain improvements in holders and connectors for holding papers and fancy wares, exposed for sale or for private use.

1467. John Moule, Scabright Place, Hackney Road—An improved self-acting apparatus for precipitating and collecting from solutions metals and their salts, part of which apparatus is applicable to flushing purposes.

1468. William Gray and Robert Gardiner, Farningham, Kent—Improvements in reaping and mowing machines.
1469. Benjamin Pavyer, Bartholomew Close—Certain new or improved machinery for "rubbing" type.—(Communication from James G. Pavyer, St. Louis, U. S.)
1470. Edward Deane, Arthur Street East, London Bridge, and Willoughby D. Marsh, James Street—Improvements in kitchen ranges or apparatus for cooking.
1471. John Hickman, Brampton Ash, Northampton—Improvements in draw bars for railway carriages and trucks.
1472. Charles Henderson, Leicester—Improvements in flooring and bench cramps.
1473. William Clark, Chancery Lane—Improvements in storing and preserving grain, and in the apparatus connected therewith.—(Communication from Mr. Charles J. E. Pavy, Boulevart St. Martin, Paris.)
1474. Henry Widnell, Lasswade, Edinburgh—Improvements in printing and steaming threads and yarns of worsted and other materials for carpets and other fabrics and in the apparatus employed therein.
1475. Edward Stone, Lime Street—Improvements in machinery for cutting veneers.—(Communication from John Ahshohs, Forty-Third Street, New York, U. S.)

Recorded June 18.

1476. Thomas Kershaw, Baker Street, Portman Square—Improvements in apparatus for imitating various fancy woods, marbles, granites, and stencillings.
1277. John King, Wellesbourne, and Frederick Southam, Eatington, Warwickshire—A new or improved rope porter, to be used in steam ploughing or cultivating.
1478. Hamlet Nicholson, Drake Street, Rochdale, Lancashire—A new and improved cricket and playing ball.
1479. Robert Dressel, Amelia Villas, De Beauvoir Grove, Kingsland Road, and Augustus Figge, High Holborn—Improvements in the manufacture of yeast.
1480. Thomas W. Keates, Chatham Place, Blackfriars—An improved mode of separating carbonic acid gas from the gaseous products derived from the distillation of peat and other vegetable matter.

Recorded June 19.

1481. James Braby, the younger, Bridgehouse Place, Southwark—Improved machinery for lifting or breaking up roads or ways, crushing clods, and scarifying or tilling land.
1482. Augustus B. Childs, New Oxford Street—Improvements in the manufacture of a portable pocket match safe.—(Communication from Albert M. Smith, New York, U. S.)
1483. Alexander R. Arrott, St. Helens, Lancashire—Improvements in the manufacture of carbonate of soda.
1484. Michael Baragwanath, Church Lane, Truro, Cornwall—An improved portable hydraulic punch.—(Communication from Richard Dudgeon, New York U. S.)
1485. Joseph Harrison, Glossop, Derby—Certain improvements in machines for spinning cotton, and other fibrous substances.
1486. John Walker, City Road—Improvements in mills or machinery for expressing juice from the cane and other like vegetable substances.
1487. Richard A. Brooman, Fleet Street—Improvements in locks.—(Communication from Auguste T. Baudrit, Paris.)
1488. Joseph J. Welch, Cheapside—Improvements in neck-ties, scarfs, and cravats.

Recorded June 20.

1489. William Kendal and George Gent, Salford, near Manchester, Lancashire—Improvements in machinery or apparatus for making gas burners.
1491. William W. Sleigh, Myddleton Square—The neutralific motive power engine.
1492. George Hinton, Birmingham, Warwickshire—Improvements in cupola furnaces.
1493. Alfred Arthur, Polygon, Southampton—Obtaining and applying motive-power.
1494. Henry Wimhall, Aldermaston, Berkshire—Improvements in machinery or apparatus for making bricks, tiles, and drain pipes.
1495. Henry Hart, Cambridge Villas, South Street, Greenwich, Kent—Improvements in machinery or apparatus for cutting and shaping metals and other substances.
1496. Edward B. Webb, George Street, Westminster—Improvements in breakwaters and piers.
1497. Henry F. Hiron, Chipping Campden, Gloucestershire, and Richard Fell, Albion Place, Walworth, Surrey—An improved vertical paddle wheel.
1498. Francis C. Simons, late Captain in the Bengal Artillery—Improvements in ordnance.
1499. Rudolph Bodmer, Thavies Inn, Holborn—Improvements in machinery for washing textile fabrics.—(Communication from Charles Brown, Winterthur, and F. Witz, Frauenfeld, Switzerland.)
1500. Francis Preston, Manchester, Lancashire—Certain improvements in machinery for shaping and cutting file sand rasps.
1501. Adolphe Corroyer, Orchard Street, Bloomsgrove, Radford, and Moses Barton, Nottingham—A new or improved washing machine with the machinery or apparatus employed therein.

Recorded June 21.

1502. John Telfer, Argyle Place, Newcastle-upon-Tyne—Improvements in capstans and winches for hoisting, which improvements are also applicable to the steering of ships.
1503. John Smith, Birmingham, Warwickshire—Improvements in the manufacture of composition jewellery and ornaments, and in cases for jewellery, photographs, and for other similar purposes.
1504. William A. Munn, Throwley House, Faversham, Kent—An improved cartridge pouch.
1505. Dennis Lee and Anthony Welsh, Leeds, Yorkshire—Improvements in means or machinery for preparing and polishing marble.
1506. Thomas Walker, Birmingham, Warwick—Improvements in means or apparatus for indicating the height of water in steam boilers.
1507. William Baker, Sheffield, Yorkshire—Improvements in the process of softening and purifying lead.
1508. William P. Eastman, South Street, Finsbury—Improvements in bolts for fastening doors, gates, and windows.—(Communication from Henry Burt, Newark, New Jersey, U. S.)
1509. William Reade, Hibernia Chambers, Southwark, Surrey—Improvements in apparatus for singeing and preparing the skins of pigs previous to cureing.
1510. William Clark, Chancery Lane—Improvements in machinery or apparatus for the manufacture of envelopes.—(Communication from Mr. Laurent Poirier, Paris.)
1511. Henry B. Stevenson, Alfred Street, Bedford Square—Improvements in apparatus for propelling and in other rotary apparatuses.
1512. Arthur T. Clark, and John Price, High Street, Southampton—Improvements in signal lanterns.
1513. William Buckwell, Phœnix Stone Works, East Greenwich, Kent—Improvements in moulding blocks, slabs, pipes, and other articles and in the apparatus to be employed therein.

Recorded June 22.

1514. Aignan Jutteau, Orleans, France—A new system of plating and plastering houses and public buildings, with natural stones.
1515. William Morris, Minories, and Henry Mapple, Child's Hill, Hampstead—Improvements in apparatus for electric clocks and telegraphs.
1517. William Howells, St. Catherine Street, Carmarthen, South Wales—A portable window platform.
1518. George, Simpson, Calm Cottage, Coole Street, Whitehouse Lane, Sheffield, Yorkshire—Improvements in wine decanters and waggon or travelling decanter stand.
1519. William E. Gedge, Wellington Street, Strand—Improvements in saddlery and harness.—(Communication from Auguste Duchene, Vouziers, Ardennes, France.)
1520. William E. Gedge, Wellington Street, Strand—Improvements in blinds called Venetian or jalousies.—(Communication from Victor Bellut, Puy en Velay, Haute Loire, France.)
1521. Walter Macfarlane, Glasgow, Lanarkshire—Improvements in water-closets, and sewerage and sanatory apparatus or appliances.
1522. John Wilson, Glasgow, Lanarkshire—Improvements in the manufacture or production of sulphur or brimstone, sulphurous acid, and sulphuric acid.
1523. Nicholas Grattan, South Mall, Cork, Ireland—Improvements in gilding steel and other metals.
1524. William E. Newton, Chancery Lane—Improvements in lithographic printing presses.—(Communication from Jean B. Hoguet, Paris.
1525. John Dewick, New Lenton, Nottingham—Improvements in bobbin net or twist lace machinery.
1526. Richard A. Brooman, Fleet Street—Improvements in horse-rakes.—(Communication from Gustave Hamoir, Saultain, France.)

Recorded June 23.

1527. John Ramsbottam, Crewe, Cheshire—Improvements in supplying the tenders or tanks of locomotive engines with water.
1528. David Dawson, Milnes Bridge, Huddersfield, West Riding, Yorkshire—Improvements in the dyeing of cotton, wool (or waste), black and brown.
1529. James Joyce and Abraham Morley, Birmingham, Warwickshire—A new machine or improved mechanical arrangements, or combinations for the manufacture of stockings, vests, and other articles of hosiery.
1530. James Ward, Queen Street, Pimlico—Improvements in water closets.
1531. Robert Jobson, Dudley, Worcestershire—Improvements in moulding articles of earthenware or porcelain.
1532. Henry Jones, Annery, near Bideford—Improvements in water closets.
1533. Robert A. Boyd, Southwark, Surrey—Improvements in singeing or burning the hair of pigs.
1534. Joseph Laue, Cranbrook Street, Old Ford—Improvements in apparatus for grinding edge and other cutting tools.
1535. David C. Dinsmore, Boston, U. S.—An improved churn.—(Communication from Rufus Lapham and Riley P. Wilson, New York, U S)
1536. Pierre Pailleron, Chandon Loire, France—An improved apparatus for distilling.
1537. Edward Gatwood, Holmer, near Hereford—Improvements in making wheels, applicable to railway carriages and locomotive engines.

Recorded June 25.

1538. Abraham Barnsley, Rowley Regis, Staffordshire—Improvements in apparatus for the manufacture of welded iron tubes.
1539. David C. Dinsmore, Boston, U. S.—Improvements in machinery for splitting leather, and cutting the heels of boots and shoes.
1540. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow—Improvements in hydraulic apparatus for obtaining motive power, and for raising water.—(Communication from Louis Coignard, Paris.)
1541. Henry Creaser, York—Improvements in reaping and mowing machines.
1542. George Davies, Serle Street, Lincoln's Inn, and St. Enoch Square, Glasgow, Lanarkshire—Improvements in the needles used in machinery for manufacturing ribbed stocking fabric.—(Communication from Hilaire A. Quinquarlet, Paris.)
1543. William Routledge, Salford, near Manchester, Lancashire—Improvements in self-acting feed apparatus for steam boilers.
1544. William Higginbottom, Whittington, Derby—Improvements in pipe joints and valves for gas or water mains, and sanatory purposes generally.
1545. Edwin T. Truman, Old Burlington Street—Improvements in horse shoes.
1546. William Hooper, Mitcham, Surrey—Improvements in reworking compounds of India-rubber and sulphur, and in insulating telegraphic wires or conductors.
1547. William Reade, Hibernia Chambers, Southwark, Surrey—Improvements in apparatus for carbonizing or partially charring the skins of pigs previous to cureing.

Recorded June 26.

1548. George J. Firman, Borough Road, Southwark—Improvements in furnaces and fire-places.
1549. Matthew Cartwright, Crescent, Carlisle, Cumberland—Improvements in the manufacture of mouth-pieces for dental and other purposes.
1550. William H. Hudson, Widemarsh Street, Hereford, and John Evans, Lugwardine, Herefordshire—Improvements in locks
1551. John Shaw and Joseph T. Pope, Burslem, Staffordshire—Improvements in the articles technically known as "flys," or "flyers," used in the process of spinning and preparing woollen, worsted, cotton, and other fibrous materials.
1552. Jabez E. Barnsley, Cowley Regis, Staffordshire—Improvements in the manufacture of welded iron tubes, and in machinery employed in the said manufacture.
1553. Henry Cartwright, Dean Broseley, Salopshire—Improvements in means or apparatus in connection with steam engines, to facilitate the working of the same expansively.
1555. George T. Peppe, Sydenham, Kent—Improvements in apparatus for keeping time, for weighing letters and other matters, and for levelling.
1556. William E. Newton, Chancery Lane—Improved machinery for the manufacture of lace or bobbin net.—(Communication from Messrs. L'heureux, Brothers, St. Pierre les Calais, France.)

Recorded June 27.

1557. William Macnab, Greenock, Renfrewshire—Improvements in and connected with marine and other steam engines.

1558. Robert Formby, Liverpool, Lancashire—Improved apparatus for applying water power to the working of ships' pumps and winches, and to other useful purposes.
1560. John Mackintosh, North Bank, Regent's Park—Improved compounds for coating of insulating submarine or other telegraphic wires, also in rendering the gutta percha or India-rubber coatings of telegraphic wires impervious.
1561. John C. Evans, East Greenwich, Kent—Improvements in machinery or apparatus for rolling or drawing metals and other substances partly applicable to the covering of electric telegraph cables, and to the manufacture of wire and other ropes.

Recorded June 28.

1562. William H. Fletcher, Denmark Court, Golden Lane—Improvements in the form and arrangement of stoves for heating irons, used for dressing and polishing shirts, collars, and similar articles, and also in the figure or form of the said irons.
1563. Christopher Binks, Parliament Street, Westminster—Improvements in manufacturing oxygen gas.
1565. William Pidding, Borough Road, Southwark, Surrey—Improvements in fire-lighters, their form or shape, and the machinery or apparatus used in their manufacture.
1566. James Blakeley and William H. Blakeley, Netherton, Huddersfield, Yorkshire—Improvements in machinery or apparatus for sawing or cutting wood, bone, ivory, stone, or other vegetable, animal, or mineral substances.
1567. Charles Bosselaers, Mark Lane—An improved apparatus for corking bottles, jars, and other vessels.—(Communication from Francois Vander-Hagen, Brussels, Belgium.)
1568. Jacob Allen, Trafalgar Wharf, Ratcliffe Cross Stairs, and Josiah Glasson, Fore Street, Limehouse—An improved method of connecting together the several tubes used in connection with steam boilers for superheating steam.
1569. William Campion and William Campion, Nottingham—Improvements in sewing machines.
1570. Westley Richards, Birmingham, Warwickshire—Improvements in ordnance, also in cartridges and cap holders.

Recorded June 29.

1572. John Sale, Chesterton, Staffordshire—Improvements in the construction of ovens, and of chambers in ovens for firing bricks, tiles, pipes, quarries, and other articles of the like nature.
1573. John Whitehouse, Birmingham, Warwickshire—An improvement in the manufacture of metallic door and other nobs, and a new or improved method of connecting door and other knobs with their spindles.
1574. Thomas Wilson, Birmingham, Warwickshire—Improvements in breech loading fire arms and ordnance, and in cartridges.
1575. James Taylor, Birkenhead—Improvements in locomotive engines and wheel carriages.
1576. James Soutter, Hoxton—Improvements in steam boilers, and an improved arrangement of steam engine to be used therewith.
1577. Francois Vouillon, Louviers, France—Improvements in drawing, twisting, and felting filamentous, fibrous, or textile materials.
1578. William Hale, John Street, Adelphi—Improvements in impelling shells or shots, and in apparatus for directing their flight from ships or vessels, which apparatus is applicable to guns or mortars used on board ship for preventing them being acted upon by the pitching or rolling of the ship or vessel.
1579. George C. Morgan, New Castle, Pennsylvania, U. S., and Chancery Lane—Improvements in looms.—(Communication from Mr. Joseph Clifton, New Castle.)
1580. Georc C. Morgan, New-Castle, Pennsylvania, U. S., and Chancery Lane—Improvements in the manufacture of driving belts and straps.—(Communication from Mr. Joseph Clifton, New-Castle.)

Recorded June 30.

1581. Claude J. N. Rebour, Paris—A new motive power, so called Rebour's motor.
1582. William E. Gedge, Wellington Street, Strand—Improved bricks and tiles.—(Communication from Cizi Paul Contanceau, Toulouse, France.)
1583. Andrew Hawksey, Saint Helens, Lancashire—An improved method of drawing and withdrawing window curtains, and other similar hangings.
1584. Thomas Cox, Robert Harrington, Birmingham, Warwickshire, and William Holland, King's Norton, Worcester—Improvements in the manufacture of runner notches and top notches for umbrellas and parasols.
1585. Henry F. Cohade, Gravelle, Saint Maurice, Charenton, France—Improvements in obtaining motive power.

Recorded July 2.

1587. James Newhouse, Farnworth, Bolton-le-Moors, Lancashire—Certain improvements in machinery for spinning and doubling cotton and other fibrous materials.
1588. Celestine P. Gontard, Boulevart de Strasbourg, Paris—Improvements in remontoirs for winding up and setting right watches without keys.
1589. Louis F. Moulin, Rue du Houblon, Brussels, Belgium—An improved system of water-gauge for steam boilers.
1591. Edward C. Nicholson, Kennington Road, Surrey—Improvements in the manufacture of a peroxide of lead having peculiar oxidizing properties.
1592. Ephraim Chetwyn, Worcester—Improvements in the manufacture of gloves.
1593. Hobert H. Bishop, Bristol, Connecticut, U. S.—Improvements in sewing machines.
1594. John A. Salmon, Glasgow, Lanarkshire—Improvements in apparatus for feeding boilers, and in furnaces.
1595. William E. Gedge, Wellington Street, Strand—Improvements in chairs and other articles of furniture, to be used principally at sea.—(Communication from Victor G. M. J. N. Derotree, l'Ile Dieu, Vendee, and Arsene Charrier, Noirmoutiers, Vendee, France.)
1596. Richard A. Brooman, Fleet Street—Improvements in the manufacture of hats.—(Communication from Augustan Durand, Paris.)
1597. Richard A. Brooman, Fleet Street—Improvements in harrows.—(Communication from J. C. C. Meyn, Hamburg.)

Recorded July 3.

1598. Charles Stevens, Welbeck Street, Cavendish Square—An improved navigable balloon or ærostatic ship.—(Communication from C. F. Rahlat, Paris.)
1599. Henry J. Standly, Pall Mall, East, Westminster—Improvements in retorts, crucibles, and other vessels, employed for the purposes of fusion and distillation.
1600. Charles J. E. Dumont, Liege, Belgium—Improvements in machinery or apparatus for separating minerals and substances of different specific gravities.
1601. James Haughton, Gomersal, Yorkshire—Improvements in machinery or apparatus for slubbing and spinning wool or other fibrous substances.
1603. Robert N. Reid, University Street—Improvements in insulators for electric telegraph purposes.
1604. Joseph Lane, Cranbrook Street, Old Ford—Improvements in screw-cutting lathes.
1605. Richard A. Brooman, Fleet Street—An improved fabric, suitable for holding charges of gunpowder.—(Communication from Heinrich J. Natorp, Hamburg.)
1606. Lionel E. Weber, Hotel de Bellevue, Brussels—Improvements in pipes and cigar holders.
1607. John B. Broadhurst, Compstall, Stockport, Cheshire—Improvements in heating water for steam boilers.
1608. Thomas Richardson, Newcastle-on-Tyne—Improvements in purifying coal-gas.
1609. James Morris, Albert Spuare, Clapham Road, Surrey—An improved key for securing railway rails.
1611. Francois Durand, Paris—An improved means of driving spindles used in spinning machinery, applicable also to the communicating of rotary motion for other purposes.
1612. Francois Durand, Paris—An improved mode of purifying the Thames, and other tidal rivers.

Recorded July 4.

1613. William Skinner, Williamsburgh, Massachusetts, U. S.—A new and improved machine for stretching and glossing silk.—(Communication from Lucius Dimock, Hebron, Connecticut, U. S.)
1614. George S. Harris, Oxford Street—Improvements in apparatus for rapidly cooling or refrigerating water, wine, beer, or other liquids.
1615. Samuel Perkes, Clapham, Surrey—Improvements in presses and modes of pressing applicable, to cotton, hemp, wool, coir, hides, hay, fibres, peat, linen, thread, piece-goods, extracting oil, and other useful purposes.
1616. James Thomas Peter Newbon and Thomas Smith, Fenchurch Street—Improvements in apparatus or machinery and gearing for working, stopping, and holding chains in ships or vessels, and for moving or retaining heavy weights.
1617. Henry J. Standly, Pall Mall East, Westminster—Improvements in the production of gases for illumination and other purposes.
1618. John Shipley, Elton Street, James Taylor, Asylum Street, and Joseph Shuttlewood, Thorpe Street, Leicester—Improvements in knitting machinery.
1619. James Haywood, and Thomas Claridge, Derby—An improved arrangement of combined thrashing and dressing machine.
1621. Alexander Doull, Westminster—Improvements in excavating or clearing away earth, sand, and other substances, prior to forming foundations under water and otherwise.
1622. John Blake, Sheffield, Yorkshire—Improvements in the manufacture of guns and fire arms of steel.
1623. Cadogan Williams, Newcastle, Glamorganshire—Improvements in means or apparatus for the protection of the coast of a country from invasion by ships or other vessels.

Recorded July 5.

1625. William S. Squire, Acacia Road, Saint John's Wood—Improvements in the production of colours for dyeing and printing.
1627. John Ogden, Manchester, Lancashire—Certain improvements in power looms for weaving.
1628. Walter Hood, Glasgow, Lanarkshire—Improvements in ladies' riding trousers.
1629. Henry J. Standly, Pall Mall East, Westminster—Improvements in the production of gases for illumination and other purposes.
1630. Alfred V. Newton, Chancery Lane—An improved construction of spring butt hinge.—(Communication from George B. Pierson, New York, U.S.)
1631. William F. Thomas, Newgate Street—Improvements in sewing machines.
1632. Joseph Noone, Peterboro', Hillsboro', New Hampshire, U. S.—A new and useful improvement in the carding machine.—(Communication from Joseph Davies, East Wilton.

Recorded July 6.

1633. Benjamin Lambert, Warner Street, Dover Road—Improvements in treating printed paper to remove the ink and to obtain pulp, and also in treating printers' rags to remove the ink therefrom.
1634. Weston Grimshaw, Lower Broughton, Manchester, Lancashire—Certain improvements in machinery for compressing brick, earth, and other materials.
1635. Joseph De Maegt, St. Josse-ten-Noode, near Brussels, Belgium—Improvements in the manufacture of paper.
1637. Edward T. Hughes, Chancery Lane—Improvements in machinery or apparatus for pressing and ironing, applicable to clothing, book-binding, and other purposes.—(Communication from Auguste F. Dusautoy, Boulevard des Italiens, Paris.
1638. Emil Biedermann, Rockingbam Row, New Kent Road, Surrey—Improvements in apparatus for the measurement of gas and other fluids.
1639. Thomas Doublet, City Road, Finsbury Square—Improvements in rifles and other fire-arms.

Recorded July 7.

1640. John Leslie, Conduit Street, Hanover Square—Improvements in the manufacture of gas.
1641. Jonathan Bircumshaw, New Lenton, Nottingham—Improvements in machinery for the manufacture of warp fabrics.
1642. Everett A. Snuggs and John Snuggs, New Windsor, Berks—Improvements in the manufacture of tea-kettles and fountains, coffee-pots, cans, saucepans, stewpans, pails, and other articles of a similar character for domestic use, and baths, watering pots, and other articles of a similar description.
1643. James Newman, Birmingham, Warwickshire—Improvements in the manufacture of hooks, and other similar dress-fastenings.

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 23rd June to 6th July, 1860.

June 23rd,	4268	Joseph Holder, Chunk Works, Coventry Road, Birmingham—"Corner-joint for a fender."
—	4269	Thomas Long, 2 Westbourne Grove, North Notting Hill, W.—"New and improved beetle trap."
28th,	4270	Fountain John Hartley, 21 Pump Row, Old Street Road, E.C.—"Improved clasp or fastener for umbrellas and parasols."
29th,	4271	Alexander Adie & Son, 50 Princes Street, Edinburgh—"The doublet achromatic object glass for telescopes and opera glasses."
30th,	4272	Thomas Gullick, 24 Pall Mall, S.W.—"The eclipse box spur."
July 4th,	4273	Drury, Brothers, The Don Tool Works, Sheffield—"Drilling brace."
6th,	4274	Cyrus Price, Mill Street, Wolverhampton—"An improved lock."

TO READERS AND CORRESPONDENTS.

R. C., NOTTINGHAM.—We fear this is an impracticable scheme. Why heat the water first and then transmit the heat so applied in the form of steam to the air? Would not heating the air direct be much more simple and economical?

PATENT SPECIFICATIONS.

By the Authors of "The Patentee's Manual."

All questions arising out of specifications are interesting to the large and increasing class of patentees, and we shall therefore make no apology for drawing attention to some cases recently decided in the law courts on this subject.

The first case to which we shall allude is that of *Hills* v. *The London Gaslight Company.* When illuminating gas is obtained from coal by means of heat, it contains, amongst other noxious impurities, sulphuretted hydrogen, which it is highly desirable to remove before it is taken into our houses to be burned. The old method of removing the sulphuretted hydrogen was by means of lime, but the process was objectionable on the ground that the residuum was very offensive and injurious to health. Many experiments had therefore been made in order to discover some purifier which would answer the purpose in view without generating noxious matter; and Mr. Hills, who was an operative chemist, and had been employed in more than one gas manufactory, had discovered that hydrated oxide of iron would effectually absorb the sulphuretted hydrogen, and could itself be purified by simple exposure to the air, so that it could be employed again and again. Hill's specification referred to the sulphates, oxychlorides, or the hydrated or precipitated oxides of iron, either alone or mixed with sulphate of lime, or sulphate or muriate of magnesia, barytes, strontia, potash, or soda. These salts were to be mingled with sawdust, or peat charcoal, or breeze or other absorbent material, so as to make a very porous substance easily permeable by the gas; and the compound material being placed in a suitable vessel, the gas was to be passed through it, and would thereby be deprived of its sulphuretted hydrogen, as well as some others of its impurities.

An infringement having been committed, Mr. Hills brought his action against the London Gas Light Company, and on the case coming on for trial, it was shown, that as far back as 1840, Mr. Croll obtained a patent for purifying gas from sulphuretted hydrogen, by means, amongst other oxides, of "the oxides of iron." Moreover, it appeared that a person named Laming had patented in 1846 a process for purifying gas, in which after mixing muriate of iron with lime and chalk, he employed the resulting chloride of calcium with the oxides or carbonates (which he said were useful and need not be removed,) in the purification of gas.

A verdict having been given for the plaintiff, at the trial presided over by Baron Bramwell, with liberty for the defendant to move the court above, either to set aside the verdict and enter one for the defendant, or for a new trial; the defendant moved accordingly, and several days were occupied by the arguments of counsel. The patent, however, was upheld, the court refusing to make absolute either branch of the defendant's rule. In arguing the motion for leave to enter a verdict for the defendant, the plaintiff's specification was subjected to a rigid examination and many points were raised, which we shall proceed to notice.

Of course, every one who has had anything to do with patents, is aware that if an invention has been described in the specification of one patent, a subsequently obtained patent for the same thing is bad, although the latest patentee re-invented the thing out of his own head. In this case, Croll's and Laming's patents were brought forward to show that there had been a prior publication of Hills' invention, and that it was therefore destitute of novelty. Now, it certainly appeared that Croll had mentioned oxide of iron as a material to be used in the purification of gas, and this at first sight seemed enough to render the later patent invalid. But, it was argued that the plaintiff's invention was the application of a *hydrated* oxide of iron, whilst Croll had spoken of oxides of iron generally, that is, both anhydrous and hydrated oxides. The court said that whether they confined their attention solely to Croll's specification, or whether they considered it with reference to the evidence given to explain it, they had arrived at the conclusion that the specification included both kinds of oxides. But then it was argued that since some oxides would, and some would not answer the purpose, it still remained matter of investigation and experiment to ascertain what oxides would attain the desired end, and that as Mr. Hills had done this, he was entitled to a patent for the discovery. With this view the court concurred, saying that on the mere comparison of the two specifications, although oxides of iron were in both, it was not to be concluded, as a matter of law that Croll had anticipated Hills, since it was left to Hills to ascertain and point out the particular oxide that would serve the object in view.

Now turning to Laming's specification, it was argued that since Laming had by his combination of salts produced oxide of iron, and employed the resulting compound in the purification of gas, Hills had been thereby anticipated. He had, it is true, used sulphate of lime instead of muriate of lime, (chloride of calcium,) but this it was insisted was a mere colourable variation. However, as there was evidence to the effect that there was an essential difference between the muriate and the sulphate of lime, which evidence had apparently satisfied the jury, the court was not prepared to take any notice of the objection.

Another point taken against Hills' specification was, that his language was ambiguous when he spoke of "hydrated *or* precipitated oxides." Now, if the plaintiff meant by this, all the hydrates, it was open to the objection that the description was too wide, seeing that some of the natural hydrates would not do; but if he meant only those hydrates which were also precipitated, that is, the artificial hydrates, it was free from objection. The court held that Hills intended to use the two words synonymously, and that in speaking of hydrated or precipitated oxides, he meant such oxides as were precipitated. Consequently this objection failed.

It was also objected that the mere application of the hydrated oxides to absorb sulphuretted hydrogen was not the subject of a patent, as that property was previously known; the answer to which was, that it was not the bare principle of the absorhtion of the gas by the oxide that was the subject of the patent, but the application of the principle to a useful purpose, and the description of a process for effecting that purpose.

There were several minor points also raised in the argument of the defendant's counsel which we may as well dispose of before applying ourselves to the next case. First, the principle laid down in *Bush* v. *Fox*, as to how far a court of law is authorised to compare two specifications without the aid of a jury, was discussed. In this case the Court held that there are certain cases in which, upon the mere collocation of the two specifications, or the specification of a patent and a previously written document, the Court may come to the conclusion that the later specification is invalid for want of novelty. If, for example, identically the same words had been used in both, or if, with a variation in the words, it was quite plain that substantially the same thing had been described, in either case the Court would have the right to form its own opinion on the matter without calling upon a jury to say whether the two inventions were the same. In mechanical patents it is much easier to make such a comparison than it is in chemical patents. A court of law, for example, would not place itself in the absurd position of refusing to acknowledge that iron was heavy until the fact had been communicated to them by a jury, but it was not bound to know what oxide of iron would purify gas from sulphuretted hydrogen.

Another point was, as to the meaning of the word experiment in patent law. It appeared that Croll had purified several thousand cubic feet of gas by oxide of iron, and that such gas was sold. This, it was argued, was more than an experiment; it was such a user of the process, for which Hills had obtained his patent, as to take from it the attribute of novelty. But the Court said that if the user of an invention has been only of an experimental, and not of a substantial character, then although the thing had been done before, it did not preclude a person from taking out a patent for it. In this case, although what Croll did might not have been strictly in the nature of an experiment, being perhaps something more, still the jury had found that the user had been of a character analogous to an experiment, and the Court would not disturb their verdict.

Another case, in which certain important points of law were reviewed, was the much litigated suit of *Betts* v. *Menzies*, in which the Court of

Exchequer Chamber has lately given judgment against the patent. Mr. Betts obtained a patent in 1849 for a new manufacture of capsules, and of a material to be employed therein. According to his specification, the new material consisted of lead and tin, which, in the first instance, were separately cast in ingots and rolled out into thin sheets. The sheets were then laid together, one upon the other, and pressed between rollers. The result was that the two permanently adhered together and became one sheet, tin being on one side and lead on the other of the compound sheet. Or the compound sheet might be made of lead having tin on each side of it. When the compound sheet was intended to be used in the manufacture of bottle capsules, the sheet of tin was to be one-twentieth of the thickness of the sheet of lead, when placed in contact previously to being subjected to compression.

Now, it appeared that in 1804 one Thomas Dobbs had obtained a patent for a metal produced by the union of tin with lead, in plates, by mechanical pressure. And it was contended, that Betts' invention had thus been anticipated. Various questions were raised in the course of the proceedings. 1st. Had Mr. Betts claimed the union of sheets of tin and lead in all proportions, or only in one definite proportion, viz., the union of a sheet of tin one-twentieth the thickness of the sheet of lead? 2d. Was Dobbs' invention one that had been, or could be, carried out? 3d. Were the inventions of Dobbs and Betts substantially the same? 4th. Had a court of law the power of comparing the two specifications and of forming a judgment for itself as to the similarity or dissimilarity of the two inventions?

After some trials before juries, the Court of Queen's Bench had decided against the validity of the plaintiff's patent; and this judgment went for review before the Court of Exchequer Chamber. A majority of the judges of that court confirmed the judgment of the court below; and we will now give a summary of what fell from the judges who came to that decision.

Martin, B., speaking for Pollock, L. C. B., and Bramwell, B., as well as for himself, said that the case was concluded by the decision in *Bush* v. *Fox*, which was confirmed by *Booth* v. *Kennard*. The judgment in the former case was, that if, upon the comparison of the specification of a former patent with the specification of the patent in question, it appeared that the latter patent was substantially described in the older specification, the patent was void on the ground of want of novelty; and further, that when this distinctly appeared upon the two specifications, the question was for the Court and not for the jury. The plaintiff's specification, after giving minute directions for the manufacture of the compound material, stated the applications of which it was susceptible, particularly dwelling on its use in making capsules for the stoppers of bottles and other thin articles, but proceeding to say that being made in plates or sheets of adequate thickness and size it might be employed for the purposes to which thin sheet lead, or tinned iron, or sheet zinc, or sheet tin had been commonly employed, such, for instance, as lining cisterns to contain water. Now, on reference to Dobbs' specification, it appeared that his mode of operating was to take a plate of lead and a plate of tin, of equal or unequal thicknesses, and laying them together, their surfaces being clean, to pass them through the rollers of a flattening or rolling mill so as to make the metals cohere. Amongst the applications of the article of trade thus made, that of lining cisterns was mentioned. It was quite clear, said the learned baron, upon reading these two specifications, that what the plaintiff had primarily in view was the manufacture of a thin sheet of lead coated with tin for the purpose of making capsules; and what Dobbs specified was the manufacture of a thicker and coarser but also thin combination of lead coated with tin. Now, not only was the material described in the plaintiff's specification the same as the compound metal described by Dobbs, but one of the applications of the plaintiff's material, namely, lining water cisterns, was a purpose to which Dobbs had stated his material was applicable. Assuming the plaintiff's to be a good patent, would not the manufacture of a lining for cisterns in the manner described by Dobbs be an infringement of it? In his opinion, the thing specified by Betts was substantially the same thing as that described by Dobbs, the two being made substantially in the same manner, it being a clear point in patent law, that if a newly-granted patent, assuming it to be good, would be infringed by a former patentee manufacturing an article described by him in his specification, the newly-granted patent is void for want of novelty.

Keating, J., speaking both for Bramwell, B., and for himself, said he considered that the plaintiff's specification claimed the invention of a material formed of sheets of lead and tin, not in definite proportions, but generally in any proportion. It is true, that for the making of a material suitable for capsules definite proportions had been mentioned, but it was clear that when its application to other purposes was stated those definite proportions need not be preserved. The essence of the invention, as described by the plaintiff, was the union of the two metals in sheets by pressure, and not its union in certain proportions. That being so, the invention had been already disclosed by Dobbs, and that anticipation would deprive the plaintiff's invention of novelty and his patent would be void. In answer to the argument that there was nothing to show that Dobb's invention had been or could be carried out practically, he said it was rebutted by the plaintiff's statement in his own specification, that tin and lead would adhere by pressure in any proportion. If he had said that they would adhere only in definite proportions then it might have been held that Dobbs had not anticipated the plaintiff's invention, because, though the particular proportions of the plaintiff's invention would be included in the general invention of Dobbs for all proportions, yet as it could not be said as a matter of law that all proportions would be practicable, he could not hold as matter of law that a definite proportion could not be the subject of invention and of a patent, as in the case of *Hills* v. *the London Gas Company*. Another point attempted to be made was, that a peculiar part of the plaintiff's process was the preliminary rolling or laminating of each metal separately before they were rolled together. But this was held to be extraneous to the essential part of the process, which was the making of sheets of metal to cohere by pressure.

DIRECT ACTING STEAM VENTILATOR OR BLOWER.

Messrs. Mazeline, of Havre, have brought out some ventilators driven direct by steam power, which present certain noticeable features, which we consider well worthy the attention of our readers.

The last modification constructed by these gentlemen consists of a fan and casing with a vertical steam engine for driving the same, carried on one bed plate, so as to form a complete ventilating or blowing apparatus in itself. Figs. 1 and 2 of the annexed cuts illustrate respectively a side elevation and vertical section at right angles thereto of this combined direct acting ventilator. The casing for the fan is composed of two parts, which are connected together by bolts, and are so

Fig. 1.

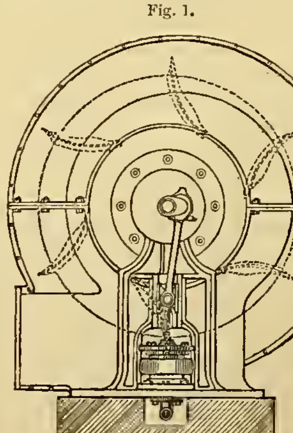
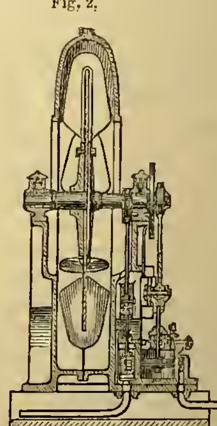


Fig. 2.



arranged as to serve also as the supports, or main frames of the machine. They are surmounted by two other parts, bolted to the former at the height of the axis of the fan, and these complete the casing, and afford facility for the ready mounting and dismounting of the pallets and their disc on the main shaft. The upper part of the casing is rounded at the periphery, as shown in fig. 2, whereby less space is lost and less waste of power incurred, as the fans or pallets correspond in shape to this rounded form of casing. The lower part of the casing only is of a rectangular form, but the angles are rounded off as shown. A large flange or collar is formed upon the shaft; this collar serves as a bolting plate, to which the disc carrying the pallets, is bolted, this disc serving as a central partition, and dividing the casing into two equal portions. A second but moveable collar is also carried by the shaft, and is bolted up to the opposite side of the disc, which is thus securely held between the two collars. This disc carries six pallets or fans of equal sizes, and they are slightly curved and rounded off at their outer ends to correspond to the form of the inside of the casing. The main shaft, which carries the disc and pallets, is placed slightly out of the centre of the casing, so that the fans approach nearer to one side of the casing than to the other, by which arrangement a good result is obtained. The air which is drawn in through the central apertures, when the fan is rotated, passes easily between the pallets and the interior sides of the casing, which space increases as the pallets approach that portion of the casing in which the escape aperture, or mouth, is situated.

In this blower the air is never compressed between two consecutive pallets, as is the case when they work concentrically within the casing, and when very little room is left between the outer edges of the blades, and the interior of the casing. Suitable oil cups are fitted with the cups of the main bearings, which support the driving shaft, and this shaft is provided at one end with a small fly-wheel, into the side of which is fitted a small bronze crank, receiving a rapid rotatory motion from the wrought iron connecting rod of the small steam engine. The lower end of this connecting rod is jointed to a copper sliding block, working accurately in fixed guides carried by the framing.

YORKSHIRE AGRICULTURAL SOCIETY.

The meeting of this flourishing society took place at Pontefract. The proceedings opened with the trial of field implements. Twenty-three reapers were shown by seventeen exhibitors, these included Burgess and Key's M'Cormick, with self-acting side delivery in swathe, by means of a screw platform; Cranston's Wood, with hand delivery in sheaf: Kearsley's Warsdale, laying the corn in swathe or sheaf; Spencer's and Sawney's reapers with Wray's mode of driving the crank by a simple screw motion; the North of England Implement Company's Britannia, with self-raking off movement; Cuthbert's Hussey, with numerous improvements in detail, and a sling for supporting one end of the cutter-bar, thus saving friction and power; Watt's machine, with the knives fixed upon a revolving endless chain; Creaser's Ebor, with rollers to take the cut-corn from the knives, and endless belts to deliver it sideways; Coates's improved Hussey; Henge's side-delivery Hussey; Richmond, Chandler, and Norton's Wray; Beckwith's reaper; and Brigham and Bickerton's American reaper. The list shows what an amount of attention is being paid to the perfecting of this valuable implement, so as to adapt it to all varieties of crop. The successful production of this machine has led also to the invention of a modification of it for harvesting our hay crops, and seven were shown. Burgess and Key's grass-mower—their first improvement of Allen's American—performed most admirably upon a fair crop of grass which was difficult cutting, while the surface provided furrows enough to try the adaptation of the machine to very uneven and irregular ground. Cranston's new Woods' mower, a cheaper and lighter machine, also worked beautifully; and as the labour for the horses was less than with its rival, the balance of advantages were determined by the judges to rest with it, and Mr. Cranston accordingly received the prize, thus reversing the award of the Royal Society at Canterbury. Some other mowers worked very well, as Brigham and Bickerton's American buckeye mower, in which cheap and clever machine the cutter bar is hinged to a lever, and so rides upon the land at perfect liberty to rise and fall, in any direction conformably to the surface of the field. The difficulty with this, as with Burgess and Key's new arrangement, is to preserve also the command of the workmen over the knife, so that he may be able to lift it bodily over obstructions which are likely to cause damage.

Steam cultivation was represented in the trial field by only two systems, Fowler's plough, and Smith's Woolston apparatus. Mr. Fowler's Canterbury 12-horse engine and apparatus ploughed fully seven inches deep, one acre and four perches in an hour, or, at the rate of $10\frac{1}{4}$ acres in a day of 10 hours, at a cost for working expenses of about 4s. per acre. If we add 1s. 6d. per acre for wear and tear, and interest of first cost, the total will be 5s. 6d. per acre; but as it is found that the saving of maintenance of the horses displaced defrays the item of wear and tear, the farmer should reckon the cost of his steam ploughing at more than the actual working expenses, or 4s. an acre in this instance. The land operated upon was not heavy, but a good lea of white clover and trefoil; the ploughing of a single furrow seven inches deep being estimated as requiring a draught or tractive force of 5 cwt. This, according to Mr. Morton's statistics on the subject, representing work worth 9s. or 10s. per acre, so that the steam plough performed the work at about 40 or 45 per cent. the cost by horse labour. With the mould-boards removed and prongs substituted, the plough also did some admirable and efficient paring and grubbing. The Woolston apparatus, with a Tuxford eight-horse engine, and improved windlass and implement, manufactured by Messrs. Howard of Bedford, and exhibited here by Robertson of Howden, grubbed or scarified 6 or 7 inches deep, $3\frac{1}{2}$ roods in one hour, or at the rate of $8\frac{3}{4}$ acres per day. The cost of the work is about 4s. per acre, or with wear and tear, over 5s. per acre; the expense by horse labour would probably be about 5s. or 6s. The work was well done, but the soil was not of the kind or in the condition suited for showing the actual value of the operation.

The show-yard contained an excellent collection of implements. Among the objects most worthy of note, we may instance the remarkable brick machine of Messrs. Bradley and Craven, of Wakefield, which turns out 1500 bricks per hour ready for the kiln, and makes them of dry clay, as it comes from the pit; Clay's cultivator and extirpator with novel and effective action for lifting the teeth clear of the work; Hancock's newly-invented ingenious butter-making machine, for preparing butter without the pressure of the dairymaid's hands, and rendering soft butter firm; Maggs and Hindley's simple, cheap, and valuable machine for weaving straw into thatch for corn ricks, in readiness against the busy time of harvest; Spight's Brigg corn and turnip horse-hoe, having a beautiful contrivance for dipping the shares into hard ground without stopping the implement; Clayton, Shuttleworth, & Co.'s steam-engine and straw-elevator; Bradford's excellent washing machines; Bentall's broadsharer, harrows, oilcake breaker, and newly-improved chaff-cutter; Tuxford & Son's portable engine and finishing thrashing machine; Busby's harvest cart, ploughs, and improved form of chain-harrow; Samuelson's turnip cutter; Richmond, Chandler, and Norton's chaff cutter; Turner's portable three-horse engine and roller mills; Ashby & Co.'s $2\frac{1}{4}$ horse engine thrashing machine and novel rotating harrows; Coulte's drills; Hornsby & Son's steam engine, combined thrashing machine, and their new iron ploughs; A. & E. Crosskill's carts; Coleman & Son's cultivator; Humphries' thrashing machine; Ruston, Procter, & Co.'s engine, thrashing machine, and saw bench, and a great many interesting machines and articles of other exhibitors.

HISTORY OF THE SEWING MACHINE.

ARTICLE XXX.

Michael Henry obtained a patent for an invention communicated from abroad, on the 26th of May, 1858, consisting of a new species of fabric, and a sewing machine employed in its manufacture. The new fabric consists of a number of superimposed layers of fibrous material as it comes from the carding engine, which layers are consolidated and stitched together by the action of needles (to which the fabric is preferably lead by guide rollers.) The stitching is effected by an improved sewing machine, wherein two sets of threads are used which may be called warp and weft threads; the needles for the warp threads being arranged and combined like a reed or comb moving suitably, in order to traverse the material, and making loops into which another needle, serving as a shuttle, inserts a weft thread.

A patent was granted to L. A. Bigelow, on the 11th June, 1858, for so constructing a sewing machine as to render it applicable to two kinds of sewing, *i.e.*, to sewing with a single thread and to sewing with a double thread. Another feature in the invention consists of certain improved mechanism for taking, spreading, tightening, and interlacing the loops, whereby the several operations are effected with greater accuracy and speed whilst there is less liability of the mechanism getting out of order.

Bryan Atwater obtained a patent, on the 16th of June, 1858, for certain improvements relative to single thread or chain stitch sewing, consisting. *First*, in an arrangement or application of one or more guide plates, with respect to the bed plate and the needle or the path of the latter, in such a manner that a loop of the thread of the needle may be formed between the plates or by the side of one of them, and, subsequently, by the forward or feeding movement of the cloth, be carried against a rest, or against the boss of one of the plates, in such a manner, as to cause the bow of the loop to spring upward into a proper position for the loop to receive the needle during its succeeding descent. *Second*, of an improved arrangement of the guide plates, with respect to one another and the needle and the bed plate, so that there may be space between the bed plate and the upper end or notch of the recessed guide plate, to admit of the two guide plates being placed in close proximity to one another, so as to hold the middle of the bow of the loop in position, and bridged across the recess of the plate in such a manner as to enable the needle to pass into the loop on the next descent of the needle. *Third*, of a peculiar mode of working the feeding foot; and, *lastly*, of a peculiar adjustable spool holder.

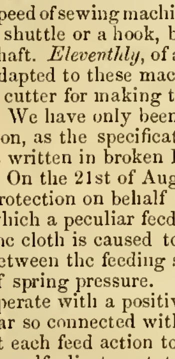
Provisional protection was granted to Charles Bordus, on the 24th of June, 1858, for embroidering or ornamenting fabrics, by sewing braid, or other trimming, over a pattern formed or traced on the fabric.

A patent was granted to Charles Callebaut, on the 4th of August, 1858, for certain improvements in sewing machines consisting, *firstly*, of a mechanical arrangement for sewing sails, sacks, and other strong articles, by the aid of suitable supports, for bringing and directing the heavy materials to be sewed. *Secondly*, of a simple mode of changing a one thread machine into a double thread machine by substituting a shuttle holder for the hook holder, and communicating motion to the shuttle holder from the main shaft by means of gearing or eccentrics. *Thirdly*, of a peculiar construction of shuttle, whereby it is prevented from rising, and may be made of any size and driven at a higher speed; this is proposed to be accomplished by making a recess in the side of the shuttle near its point, in which recess the crooked end of the driver rests. *Fourthly*, of certain modifications of the shape of the shuttle, and the addition of an outside spring, for the purpose of directing the thread when leaving the eyes of the shuttle, and of a rod and ring inside the shuttle for maintaining the thread always at the same desired angle. *Fifthly*, in the application and use of a "stopping branch" and "bridles," for stretching the thread of the needle so that it may be slack at the time of forming the stitch, and stretched when the stitch is to be drawn up tight; this "stopping branch" is driven by the needle holder when descending, and stopped before the needle holder has completed its upward stroke. *Sixthly*, of a peculiar form of "click," or feeding foot, which admits of the finest and softest fabrics being operated upon, as well as coarser and heavier materials, it is worked by an eccentric on an upper shaft, and may be grooved to allow of the sewing of rounded parts, such as the edges of hats. *Seventhly*, in hollowing or chambering the underside of the loose plate, through which the needle passes, whereby coarser threads may be used, and the necessity for cutting them obviated. *Eighthly*, in the application and use of round needles, having flutings made therein by means of a burine or cutter. *Ninthly*, in the application and use of a pressure and friction roller, worked by means of a treadle for setting in motion, stopping, and regulating the speed of sewing machines, when driven by steam power. *Tenthly*, in working a shuttle or a hook, by means of a connecting rod and crank on the main shaft. *Eleventhly*, of a peculiar apparatus for making the needles specially adapted to these machines, consisting of a pincer for holding the needle, a cutter for making the flutings, and a punch for making the eye.

We have only been able to give our readers the heads of this invention, as the specification is by no means intelligibly drawn; in fact, it is written in broken English.

On the 21st of August, 1858, Richard A. Brooman obtained provisional protection on behalf of a foreign correspondent, in the specification of which a peculiar feed motion is described. According to this invention the cloth is caused to progress by mechanism, acting so as to grasp it between the feeding surfaces and impart the feed motion without the aid of spring pressure. The means by which the feeding foot is made to operate with a positive force without spring pressure, consists of a slide bar so connected with the foot, that, while imparting a positive motion at each feed action to bring the said foot upon the cloth, it yet provides for self-adjustment to meet the requirements of different thicknesses of materials, as well as for going over seams. Another feature used in connection with the feeding foot, is a means for obviating the tendency of one surface of the cloth to slip upon the other piece (when two thicknesses are being sewed together). This is proposed to be accomplished by making a section of the table directly under the place where the foot acts, capable of sliding back and forth in the line of the feed. Both holding surfaces thus move along together, thereby causing both pieces of cloth to travel alike. Fig. 199 represents a front elevation of this feed motion. A, is the feeding foot, consisting of a curved bar, as shown, having a wedge-shaped end where it acts upon the cloth. This bar is fitted to the end of the ordinary overhanging bracket, so as to stand nearly vertical, and at one side of the needle bar, B. This feed foot has a vibratory motion imparted to it in the direction of the line of feed, as well as a vertical motion perpendicular to the table. A slot is formed in the shank, at *a*, through which a pin is passed which connects it to the bracket. The slot admits of the feed foot rising and falling, and the pin forms the centre upon which it vibrates laterally. The position of this pin in the slot regulates also the vertical movement of the feed foot. The two motions of the feed foot are derived from separate pieces of mechanism, the most important of which is that for raising and lowering the foot, because as this is effected by positive force, the principle of self-adaptation to act on various thicknesses of materials without the aid of spring pressure, is involved in it. This raising of the foot is done by means of the "slipping bar," C, which is a flat plate pressed against the side of the feeding bar, A. A slot is cut in the "slipping bar," at *b*, through which slot, and through the feeding bars

Fig. 199.



is passed a screw and nut, as shown, which hold the two bars more or less tightly to each other. The pressure between the two bars is so regulated as to give the required friction for raising the feed foot and bringing it down with sufficient force to grip the materials which are being sewn. The bar, C, is operated upon by a crank, or cam, which produces the up and down motion desired, and the amount of this motion is regulated by the slots made respectively in the two bars. D, is the cam and crank which operate the needle slide, B, and produce the lateral or feed motion in the feeding bar, as well as its vertical movement, the latter being effected by the aid of a bell crank lever, not shown in the illustration annexed. The cam, D, communicates the feed motion to the foot by striking the tail, *c*, of the crank lever, E, the other end, *d*, of which is provided with an adjusting screw or stitch regulator, which bears upon the upper end of the feeding bar and causes it to vibrate in the direction required. F, is the sliding plate, or table, contained in a recess in the fixed table, so as to lie flush with its surface and be guided at those sides which are parallel to the line of feed. There is a cross cut, or notch, made in this plate, into which the end of the wedge-shaped foot enters, and thereby draws it along. The return stroke of the plate is effected by a spring beneath the table. When feeding the cloth the action of the feed foot is to force the materials down into the cross cut, and there a firm grip is given to both pieces; and as the plate moves at the same time with the feed foot, the two thicknesses of cloth are carried along with it. The moment that the foot rises for a new hold, the plate, F, being no longer held, flies back, slipping past the cloth to its original position in readiness for another feed.

F. W. Briud obtained a patent on the 7th of September, 1858, for certain improvements in sewing machines, the specification of which our readers will find at page 38, vol. iv. (second series).

A patent was granted to Francis F. Emery, on the 22d of September, 1858, relating to machinery for sewing by the conjoint operation of a needle or bobbin and a hook or contrivance for catching a loop formed by the needle and drawing it round the bobbin in such a manner as to cause the bobbin to pass through the loop and carry its thread with it. The improvements consist of a peculiar mode of operating the hook about the bobbin by a compound motion produced by a crank and an arm, or by two cranks, whereby the point of the hook is made to travel either in an elliptical or a circular path, without being reversed or made to point upwards or downwards during its rotation. Also of a peculiar arrangement of back supporter, and loop "cast off," separate from the hook, so as to operate with the hook and the front supporter or nipper of the bobbin, in a manner not only to support the bobbin, but to aid in discharging a loop from the hook. Also a peculiar arrangement of guide lip on the back supporter. Also in a peculiar arrangment and application of an auxiliary presser, or spring, in combination with the bobbin and its holder. Also in a peculiar mode of constructing the hook.

A patent was granted to John Morrison, on the 30th of September, 1858, for a means for folding or doubling over the edge of a fabric when it is required to be folded prior to being sewed. Here two parallel plates or strips of sheet metal are employed, placed at such a distance apart as to allow the fabric to pass readily between them. These plates are twisted into a spiral or screw-like form, and the edge of the fabric is inserted between them and drawn in the direction of their length, being thereby caused to follow the twist of the plates. The edge of the fabric is thus turned or doubled over itself, the amount of the folding or doubling over being determined by the number of turns made by the screw-like plates. In order to guide the fabric so as to cause its edge always to bear in the direction necessary to give the twisted plates a proper hold of it, the fabric is passed over an inclined surface, which gives it the proper direction, and afterwards over a surface having inclined grooves made therein, whereby the fabric is still further directed; or it may be guided by passing over a roller, the surface of which is formed into a screw. This doubler or folder may be attached temporarily to a sewing machine or fixed permanently thereto, in which latter case it is to be so connected as to be capable of being turned out of the way when it is not required to fold the fabric to be sewn.

A patent for an embroidering machine was granted to Thomas Twells, on the 20th of October, 1858. These improvements relate solely to the embroidering or ornamenting of looped or lace fabrics, and need not be further referred to here.

On the 7th of December, 1858, William Madders and John Waddington obtained provisional protection for a mode of embroidering fabrics when stilettoes are employed, by regulating the distances at which the stilettoes enter the fabric, which stilettoes being of a conical form will produce larger or smaller holes according as they are pushed a greater or less distance through the fabric.

Provisional protection was granted to Alexander Mackenzie, on the 16th of December, 1858, for certain improvements in the general mechanical details of those sewing machines, known as "circular needle" machines. The invention also consists in making the vertical needle of sewing machines with a broad flat socket piece, formed so as to fit accurately in a recess in the face of the needle bar, and so as to be flush with the surface of the latter; over this recess there is hinged a binding or clasping bar, the free end of which is capable of being set hard down by a pinching screw. By this arrangement the needles may be changed more readily, than under the old method of securing them whilst they are necessarily set with perfect accuracy. For curvilinear, or differential line sewing, provision is made for traversing the fabric in any predetermined line. For this purpose a disc wheel is employed, the periphery of which is cut or formed in accordance with the intended line of sewing to be produced, in the manner adopted for the surfaces used in the turner's "rose engine." This wheel is fitted up in the gearing of the machinery, so as to bear during its revolution upon the movements, in connection with the feeder, which may be effected in various ways. By this arrangement the travelling feed bar has a compound motion transmitted to it, namely, a forward traverse from the needle bar movement, and a lateral or differential traverse from the disc wheel movement, and thus the stitching may be carried on so as to suit almost any desired figure for ornamental or other work. Another part of this invention is worthy of note; it relates to an improved mode of winding the thread for the shuttle, namely, in a "cop" form, in lieu of upon a spool, whereby the thread comes directly and evenly off during the operation of sewing, without any tendency to "snarl" or coil up and get loose, as so frequently occurs with the ordinary shuttle spools. We think this last feature is more important than all the rest, and is well worth a trial. The "cop" is undoubtedly the legitimate form in which the thread should be introduced into the shuttle.

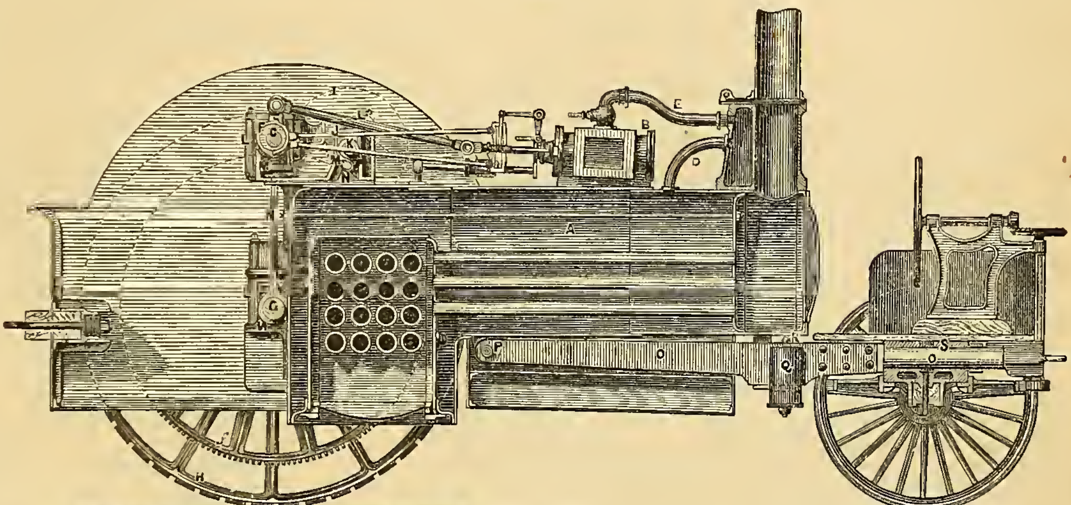
E. W. Carter and John D. Abrams obtained provisional protection, on the 29th of December, 1858, for an invention, relating exclusively to shuttle machines, and consisting in the use of two springs, one at each side of the shuttle, instead of only one, for the purpose of slightly compressing the shuttle in its race. They also proposed to use a spring or springs, within the shuttle "carriage" or arm, for the purpose of keeping the shuttle in contact with the race or guide. Two or more springs are also proposed to be employed on the under surface of the covers or plates covering the "race," so as to press upon the top of the shuttle, the object of the entire combination, or separate use of these springs, being to prevent the vibrations of the shuttle, and steady it in its "race," whereby a more equal and regular motion, and, consequently, a more equal tension of the thread is obtained. The last part of the invention we give verbatim :—"Lastly, the improvement consists in the employment and use of a circularly curved 'race' or guide of the shuttle, for causing the shuttle to move in a circular direction." Our readers will find a circular shuttle race (we believe the first of its kind) described in our notice of Mr. Morey's patent in the fifth and sixth articles of our history, at pages 123 and 150, vol. iii, second series. Morey's patent bears date, the 30th of August, 1849, or nearly ten years prior to Messrs. Carter and Abram's discovery!

On the 30th of December, 1858, R. A. Brooman obtained a patent for an embroidering machine, communicated to him from abroad. The claims are for certain peculiar combinations of needles, hooks, thread-grips, and pushers, producing festoon work by means of two threads, arranged and operated as specified. Also a peculiar mode of arranging the fabric, whereby it may receive the necessary longitudinal and transverse motions.

BARRAN'S TRACTION AND PORTABLE STEAM ENGINE.

We have of late years witnessed an extraordinary change in the practical departments of agriculture. This change has been brought about by the introduction of steam, as an essential element of farm management. The work which has been hitherto done at the slow jog trot pace of manual labour, must now be rattled off at express speed to the merry click of the agricultural locomotive engine. Now, just as the requirements of the agriculturist called for a class of engines specially designed and adapted for his purpose, so arose another want—viz., an engine adapted for traversing heavy roads and loose yielding soil, of which it could be said, that where there was heavy work to do, that was the engine to do it. The necessity of the thing speedily brought forth the machine, and under the expressive designation of the "traction engine," it soon became an established fact, rapidly adding to its laurels as its utility became day by day more fully developed. And now this class

Fig. 1.



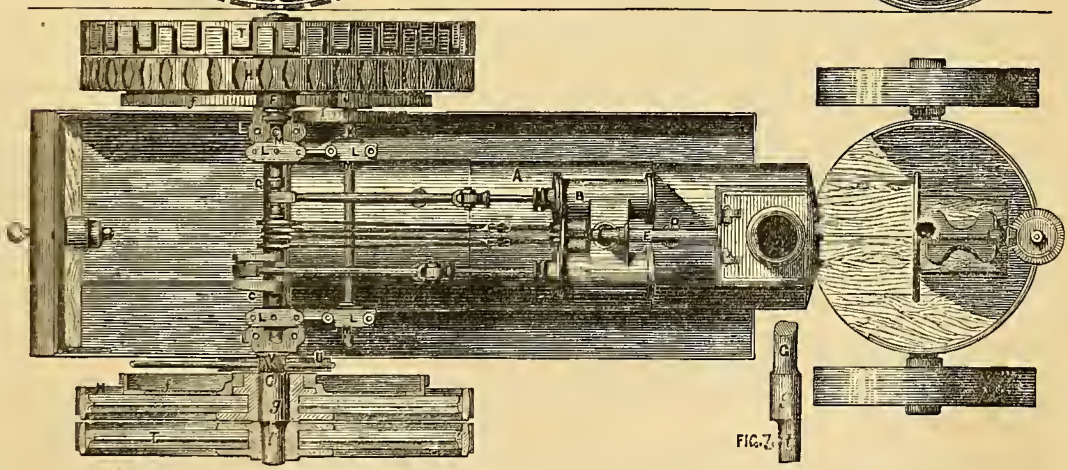


Fig. 2.

of engine bids fair to become an indispensable assistant; for whether engaged in the peaceful avocations of agriculture, either in drawing the plough or dragging huge loads, or in the sterner realities of military occupation, it Titan-like does with ease the work of a score of horses, or double the number of men. The utility of these engines has naturally called forth numerous improvements in the arrangement and construction of the details. Mr. Joseph Barrans, of Caledonian Terrace, Queen's Road, Peckham, is one of the latest who has turned his attention to the improvement of the traction engine. The subjoined engravings illustrate the nature of Mr. Barran's invention, as well as the general arrangement of the engine.

Fig. 1 is a sectional elevation of the engine; and fig. 2 is a plan, partially in section, and corresponding to fig. 1. A, is the steam boiler, which may be of the form shown, or of other ordinary construction; there are two steam cylinders, B, which give motion to the crank axle, C, by suitable connecting rods; D, is a steam pipe, leading from the boiler to a steam chest or casing partly around the chimney, by which the steam is superheated after it leaves the boiler; E, is a steam-pipe leading from such chest into the valve casing of the engines. The crank shaft, C, has at each end of it a pinion, F, which is arranged to gear with the tooth of a spur wheel, *f*, on each side of the carriage, and is fixed to one of the main driving wheels, H, running loosely on the part, *g*, of the axle, as hereafter explained. The wheel, *f*, may have teeth on the outside only, as shown in figs. 1 and 2, or on the inner and outer sides thereof, and the pinions, F, on the crank shaft are made to gear in and drive the wheel, *f*, when the driving is to be on the first motion, from the crank shaft; and such pinions are arranged to slide on the crank shaft out of gear with the wheel, *f*, on each side, and into gear with a wheel, I, on the axle, K, of which are pinions, J, which also gear into the teeth of the wheels, *f*, when it is desired to propel the carriage by the second or slow motion. Or in place of using wheels, *f*, with outer teeth only, wheels may be employed, each having an inner and an outer set of teeth, in which case the pinions, F, will be arranged to work the rings having the inner set of teeth, and the pinion, J, will gear with the rings having the outer set of teeth. The hinder part of the boiler, A, of the carriage rests on springs in the axle-boxes, L, which may be of the helical form, or they may be of vulcanised India-rubber, or made similar to those in general use; and interposed between the frame of the carriage and the bearing bushes of the main axle, G, and also at the bearing bushes of the crank shaft and the axle, K, of the wheels, I and J. The bushes, M, of these several shafts, C, G, and K, are arranged to slide in suitable guide brackets, L, on each side of the carriage and the bearing bushes, M, are kept in correct relation with the main axle, G, by means of strong links, N, on each side of the carriage, which at their upper ends are pin jointed to the bushes of the shafts, C and K, and at their lower ends they embrace the axle, G; hence the axle, G, and the axles, C and K, which carry the pinions, F and J, which work in the teeth of the wheels, *f*, will at all times be kept correct in regard to each other, although they will all come and go together with the motion of the spring and beam or lever, O. This beam is, by preference, constructed of two plates a few inches apart, the two inner ends of which are attached to the under part of the boiler at P, and move on suitable joints at that place; Q, is a spring box in it to contain a spring of vulcanised India-rubber; any other form of spring may be used. R, is a supporting pin, which is upheld by the spring, and supports the boiler at its under part as shown. The fore part of the beam or lever, O, is formed into an axle or a long round journal, which is supported in a bearing, S, in the turn table of the fore axle, by which the fore wheels and the fore axle may incline when on an uneven road or surface. The fore wheels and axle are arranged to lock, to admit of the steering of the carriage by gearing, as shown in the engravings. The hinder wheels, H and T, each consist of two wheels, but they may be arranged to consist of more than two; one of each of the two pairs of the hind wheels, as H, is arranged to rotate on the part, *g*, of the axle, G, concentric therewith, whilst the others, T, are arranged in such a manner that they may be on the axle in an eccentric position in regard to the axle, G, as they are working on the part, *t*, which is eccentric to the part, *g*, on which the other wheels work, as seen in the detached view of the end of the shaft, G, at fig. 3, which is at right angles to that of fig. 2. Thus the outside wheel, T, on each side of the carriage may at pleasure be raised off and kept raised off the road; or it may, when desired, be caused to come in contact with the road immediately below the axis, and cause the inner ones, H, to be off the ground. The eccentric motion is obtained and regulated by means of a screw wheel, U, and screw, V. The screw wheel, U, is fixed on the axis, G, and the bearings of the axis of the screw, V, are supported by brackets, fixed to the frame of the carriage, hence the axle, G, can be turned round so as to bring either of the pair of wheels, H, or T, down upon the ground or road at pleasure, according as the eccentric part, *t*, is turned up or down in relation to the centre of the main axis, G. The wheels, H, turn freely on the concentric parts, *g*, and are driven by the engines as described, while the wheels, T, run freely on the eccentric parts, *t*, and are for rolling along the ground when the carriage is being drawn, and keeping the others off the ground. The periphery of each of the wheels, H and T, is roughened or has projections thereon, as shown, to catch in the ground. The part of the axle, K, which carries the two wheels, I and J, is also formed eccentrically as regards its journals, (similar to the part, *t*, of the axle, G, fig. 3), so that, by turning round the axle, K, in its bearings, the teeth of the pinion, J, is taken out of gear with the wheel, *f*, when the carriage is driven direct by means of the pinion, F.

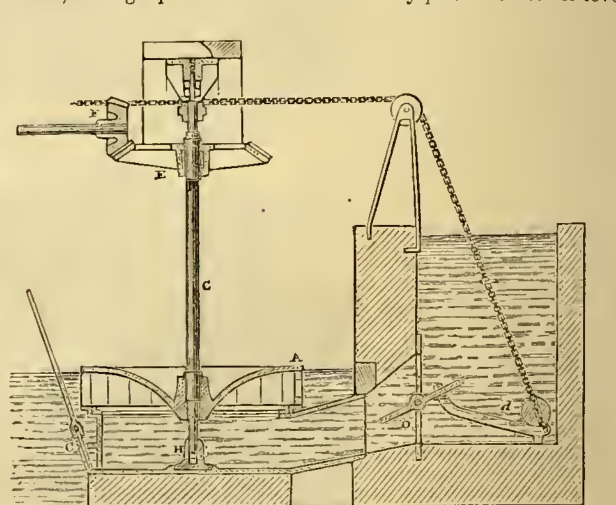
INDUSTRIAL APPLICATION OF STEATITE.

STEATITE—"silicate of magnesia"—is a mineral occuring in considerable abundance. It is extremely soft, and is most easily cut or turned into every variety of form. Owing to the facility with which steatite in compact pieces is worked, it would doubtless find many useful applications were it not that being exceedingly fragile, its manufacture has to be effected with the greatest care. In order to obviate this serious inconvenience, M. Schwartz has adopted a preliminary annealing operation, prior to the shaping or cutting of the original mineral.

Steatite being first cut into plates, blocks, or pieces of any desired form, is then placed in a muffle or crucible, and is heated to redness, and the contents are allowed to cool in a very gradual manner. Steatite, without having become hard or brittle by this operation, has acquired sufficient consistency to permit of its being worked without any difficulty; and such is the facility of manufacturing this annealed steatite, that in Germany it has found numerous applications; such as in the manufacture of buttons, cameos, &c. It is now very extensively used in the manufacture of gas burners, which possess this immense advantage over those generally employed, that they are not liable to corrosion. To give solidity and durability to articles made from steatite, in the manner we have described, it is only necessary to expose them to a red heat for a few hours. They then acquire such a degree of hardness that they will resist the action of a file, and will emit sparks when they are struck with a piece of steel. Articles made of steatite may be polished by the employment of emery, tripoli, or oxide of tin; and when they are impregnated with a solution of gold or silver and then subjected to a high temperature, they acquire a metallic lustre.

TURBINE BY M. D. BOUNET.

MONS. BOUNET, a mechanical engineer of Toulouse, has recently brought out a very simple and efficient turbine. The nature of this turbine will be understood by those of our readers who are acquainted with Cadiat's turbine, when we state that it is Cadiat's inverted, but with this difference, that the blades of M. Bounet's are united at the outer edge by a rim which is provided with a projecting rib, fitted to the inner side of the tank, so as to prevent any escape of liquid. On referring to the accompanying cut, it will be seen that the apparatus comprises a cast iron tank, resting upon a foundation of masonry placed at a lower level



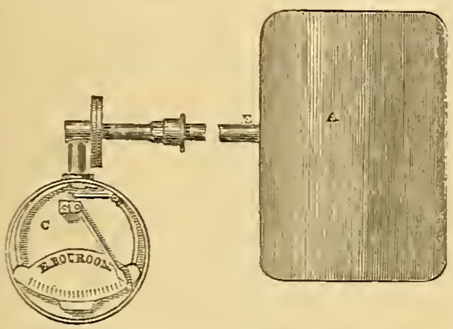
than the sluice. This tank is of a cylindrical form, and is fitted with a lateral branch or passage leading to the sluice, D. This sluice consists of a moveable plate fitted centrally upon an axis, which is turned by means of a chain acting upon a counterweighted lever, *d*. By this simple arrangement, the flow of the water from the mill race into the turbine is regulated with the greatest nicety. The upper part of the tank being completely open, receives the turbine, A, which may enter entirely therein, according to the height of the blades. A small opening, *c*, in the tank, on the side opposite to the entrance from the sluice admits of the cleaning of the tank. The body of the turbine is supported by the vertical shaft, C, carrying a wheel, E, in gear with a pinion, F, on a main overhead shaft. It must be borne in mind that the water cannot escape, neither can the turbine commence to move until it has been raised slightly, so as to disengage its blades from the edge of the tank. This elevating movement is easily effected, as the vertical shaft is guided laterally by the footstep, H, fixed to the bottom of the tank, and at its upper end by an ordinary bearing and centre screw on a level with the flooring. As it is important that the wheel, E, should be constantly in gear with the pinion, F, this wheel is made to slide along the vertical shaft when the latter is elevated. This turbine is not only noteworthy as regards its extreme simplicity, but also as respects its effective power, which, after a series of experiments conducted by Messrs. Mather and

Sons. Captain Desfaudois, inspector of the powder mills at Toulouse, and Mons. Brassinne, professor of applied sciences in the Imperial school of artillery at Toulouse, on the 27th of January, 1859, the following results were obtained :—

Number of Experiments.	Number of Revolutions per minute of the Turbine.	Total available power measured by the break.	Per Centage of available power on the absolute power of the Turbine.
1	30	18·40 Horse-Power.	0·685
2	33·5	19·80 „ „	0·740
3	35·5	19·50 „ „	0·728
4	40	20·10 „ „	0·750
5	44	20·50 „ „	0·764
6	45·5	20 „ „	0·747

PYROMETER BY M. NOBEL.

Serious difficulties have hitherto presented themselves in the construction of a really exact pyrometer. M. Nobel, an engineer at St. Petersburg, has long been engaged in the study of the heat developed by furnaces of various kinds. As the result of his experiments, he has recently brought out a very simple apparatus, most easy of application and exact in its indications. This apparatus consists essentially of a cylindrical vessel or chamber, A, composed of platinum or other refractory substance, capable of withstanding a considerable degree of heat. This chamber is connected by a tube, B, with a pressure indicator or manometer, C. Bourdon's is found to answer well. The vessel, A, is placed in the furnace, and the tube, B, is passed through a luted opening in the side thereof, and is connected at its outer end with the manometer. The inventor of this apparatus states, that bearing in mind that at a temperature of 1600°, the pressure of the air contained in the chamber, A, upon the manometer, would be about equal to six atmospheres, he suggests that by reason of the high temperature of the vessel, inconveniences may arise, and that it would be advisable to employ a rarified gas, which would give the following results at the temperatures given below :—



$\frac{1}{4}$ atmospheres,	....	0° cent.
$\frac{1}{2}$ „	....	266° „
$1\frac{3}{4}$ „	....	1600° „

M. Nobel also remarks that the gas contained in the external pipe not being at a temperature equal to that in the chamber, A, errors may arise; but, by proper calculation, these errors may be rectified, and considerably reduced by reducing the diameter of the pipe, B, to the smallest possible dimensions. The length of the pipe will depend upon the application of the apparatus. If the pipe is very short outside the apparatus of which the temperature is to be ascertained, it may be kept cool by a water bath. By using a very sensitive Bourdon's manometer, and by adding thereto an apparatus for showing the number of revolutions of the needle or indicator, the increasing temperature for each degree will be readily arrived at, allowance being made, of course, for the atmospheric pressure on the apparatus itself. In practice, however, such allowance has not been found absolutely necessary.

A NEW METHOD OF DECOMPOSING HYPOCHLORITE OF LIME IN ORDER TO EFFECT WHAT IS KNOWN AS THE "DISCHARGE."

A few years since, M. Steinbach, director of the establishment of Messrs. Steinbach and Koechlin, instituted some experiments in the hope of obtaining some improved process for effecting the bleaching and the discharging of dyed fabrics. A solution of bleaching powder was printed upon pieces of cloth, which were subsequently dried by being passed over a heated cylinder, in order that the hypochlorite of lime should become converted into chlorate of lime and chloride of calcium. The experiments were most successful, and constituted an important progression in the bleaching and discharging of fabrics. In applying this process to madder dyed fabrics a great inconvenience arose, in that pieces dyed in reds or pinks were sensibly discoloured. To overcome this great defect hypochlorite of zinc, or rather those products which result from the decomposition of hypochlorite of lime by means of sulphate of zinc are employed. The *modus operandi* is the following:—A mixture composed of water, 100 parts, by weight; gum, 50 parts; sulphate of zinc, 40 parts; is printed on the dyed fabric, and when dried the piece is immersed for two minutes in a cold bath, consisting of a solution of hypochlorite of lime, marking two degrees, Baumé.

This new process for effecting the "discharge" is much more rapid, more certain, and very much more economical than the old method; the difference being the value of sulphate of zinc compared with that of tartaric acid.

RECENT PATENTS.

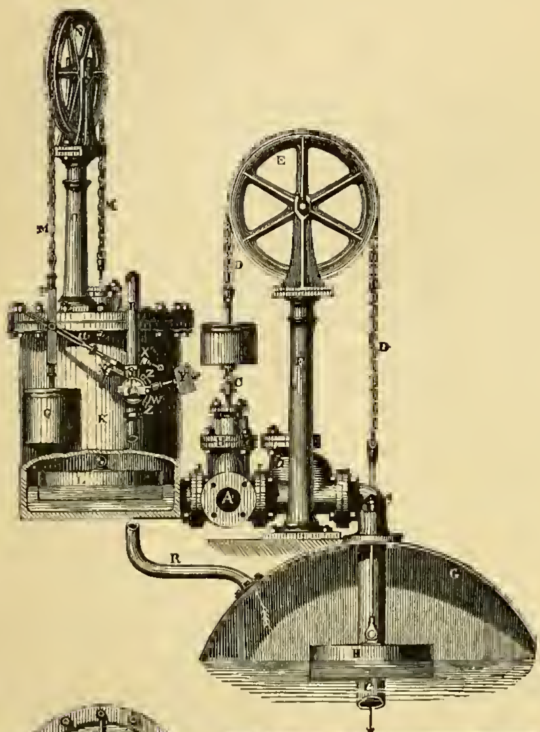
SUPPLYING BOILERS WITH WATER.

David Auld, *Glasgow.—Patent dated February* 10, 1860.

Mr. Auld pursues, with unflagging energy, the subject of automatic boiler feeding, to which branch of mechanism he has contributed so many ingenious arrangements to accomplish this desirable end. The present improvements are based, to some extent, upon the apparatus for automatically supplying steam boilers with water, which we described and illustrated at p. 288, vol. iv., *Practical Mechanic's Journal.* Under one modification the improved apparatus consists of a mechanical arrangement for the efficient supplying of steam boilers with water, so as to insure both a plentiful supply and certainty of action. A combined steam and water chamber or vertical cylinder is fitted up in convenient contiguity to the boiler to be supplied with feed water. Within this chamber is a float, the spindle of which works up through a stuffing box in the cover, its projecting end being connected to a chain or cord passed over an overhead chain pulley. The other end of the chain is connected to a short link piece, in which a lateral stud pin is fitted, and to which is hung a balance weight. As the water enters the steam and water chamber, it causes the float therein to rise, and the chain connection thus necessarily depresses the free end of the slotted lever, thus turning round the disc piece of the stop-cock until the weighted lever passes the centre, and one of the pins in the segmental slot strikes against the lever arm attached to the key. This action opens the stop-cock, and if the water in the boiler is below the proper level, that is, if it has left the dip pipe of the stop-cock uncovered, steam at once rushes from the boiler and passes into the steam and water chamber. The influx of the steam closes the ingress valve of the water in the chamber, and the pressure in the interior of the chamber being thus balanced or put in equilibrio with the pressure in the boiler, the feed water flows freely into the boiler. The float in the steam and water chamber then again descends, and the stop-cock is turned round again to its original position, in readiness for a repetition of the action. The connection between the float action and the steam valve may be made in various ways. To enable this apparatus to operate when the steam is down in the boiler, all that is nesessary is to fit up a separate float in the boiler, and connect it with the valve regulating the admission of the feed water from an overhead reservoir, so that a proper supply of feed water will always be kept up quite independent of the steam action. In this case the boiler float is itself the direct regulator of the feed water level.

Fig. 1 of the subjoined engravings, is a partially sectional elevation of one modification of the patentee's improvements; fig. 2 is a plan of the apparatus corresponding to fig. 1; fig. 3 is a front view; and fig. 4, a vertical section of the arrangement for admitting steam to the feed water chamber or reservoir, by self-acting means. According to the arrangement delineated in the accompanying engravings, the water as it flows from the supply tank or reservoir, passes through the inlet pipe, A, into the valve box, B. In this box, B, is fitted a valve; the convex surface of the dished valve rests upon the seating, which is fitted in a tubular opening under the vertical portion of the box. The spindle, C, of the valve in the box, B, passes out through a stuffing box on the upper part of the box, and is jointed to the chain, D, which passes over the pulley, E. The bearings of this pulley are carried in a pair of standards, which are bolted to a pillar, F, or other convenient support arranged near the boiler, G, the upper portion only of which is shown in the engravings. The other extremity of the chain, E, is attached to the rod of the float, H, the rod passing through a stuffing box arranged on the upper part of the boiler. In this way the valve in the box, B, is controlled by the position of the float, H, in the boiler, and when the valve is raised, the water flows into the contiguous check valve box, I, which is connected with, and arranged parallel to, the inlet valve box, B. The check valve box has fitted in it a spherical valve, which is guided in its rise and fall by means of feathers converging towards the valve seating. The valve in the box, I, is hollow, and is made sufficiently light to be raised by the ingress of the water through the valve box, but upon its descent on the valve seating, the return of the water is prevented, the valve thus serving to check or control the backward flow. From the valve box, I, the water flows through a T-shaped union pipe, J, into the chamber, K, which is by preference a cast-iron vessel of a cylindrical figure, with a moveable cover bolted to the upper part. A float, L, rests on the water contained in the chamber, K, the rod of which passes out through a stuffing box in the cover, and is connected to a chain, M. This chain is carried over the pulley, N, the spindle of which is supported in standards on the pillar, O, the latter being bolted down to the cover of the chamber, K. The other extremity of the chain, M, is connected to a link, P, to which is pendent the counterweight, Q; the position of the float, L, in the chamber, K, consequently affects in a corresponding degree that of the link and counterweight. Steam is admitted to the chamber, K, from the boiler, so as to maintain an equal pressure of

Fig. 1.



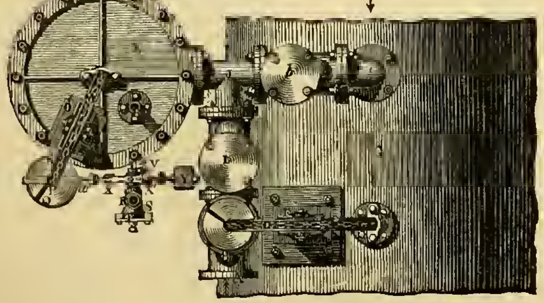
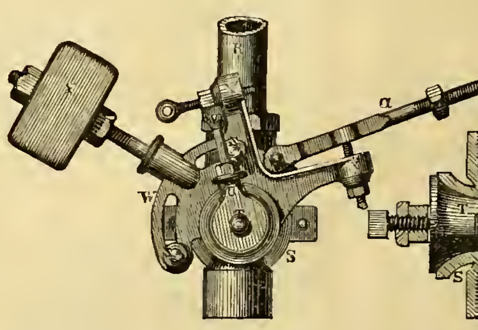


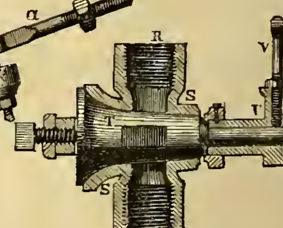
Fig. 2.

steam on the surface of the water in the chamber, K, as in the boiler. The steam passes from the boiler, G, by the pipe, R, which enters the chamber, K, through the cover, and midway in the vertical portion of the pipe is fitted a self-acting arrangement for controlling the admission of steam to the vessel, K. In figs. 1 and 2, the front and plan views of the steam cock are shown, and figs. 3 and 4 are detached front and sectional views of the same. The casing of the steam cock, S, is bored out internally of a conical or trumpet-shaped figure; the cock, T, extends out beyond the casing, and has fitted to it a tubular boss, U, which is secured to, and moves with the cock by means of the screwed arm, V. Upon the cylindrical portion of the boss, U, between the lever arm, V, and the casing, S, is fitted the forked casting, W, in the diverging arms, X and X¹, of which are two adjustable screws. This casting is carried loosely on the tubular part of the boss, U, below the arm, X¹; on one side the metal extends in a lateral direction, forming a segmental plate, W.

This part of the apparatus is formed with a laterally projecting rod, on which is carried the counterweight, Y, and there are two curved slots formed in the segmental plate in which are fitted the adjustable pins, Z. The part, W, is connected to the link, P, by means of the lever, *a*, which is centred on a stud between the diverging arms; the upper portion of this lever is slotted, as shown in fig. 2; it passes between the sides of the link, P, to which it is connected by a pin. When the float, H, in the boiler sinks by reason of the evaporation of the water, the valve in the box, B, is opened and the water flows into the chamber, K, and raises the float, L, the upward motion of which causes the descent of the counterweight, Q. In the downward movement of the link, P, the lever, *a*, presses against the screw in the arm, X, the descent of which raises the weight, Y, until it reaches the vertical position, on passing which it suddenly falls over and opens the steam cock, T, which produces an equilibrium of pressure in the boiler, O, and the vessel, K. In this position of the several parts, the water flows through the union pipe, J, into the valve box, *b*, which is similar to the check valve box, L, excepting that it is arranged in the opposite way. The water enters the inlet pipe, raises the spherical valve, and flows down the feed pipe, *c*, which is carried down to the lower part of the boiler; the arrangement of the check valves in the valve boxes, I and *b*, prevents the return of any water or steam in the direction of the vessel, K, or the inlet pipe, A. As the water in the vessel, K, flows out into the boiler, the weight, Q, ascends; the pressure of the lever, *a*, against the arm, X¹, causing the weight, Y, to fall over on the opposite side when it passes the vertical position, and so shuts the steam cock. The steam pressure being now removed, the vessel, K, is ready to receive a further supply of water, which is introduced when the float, H, raises the valve in the box, B. In this way, the vessel, K, is continually replenished, and the boiler supplied with a uniform feed of water, proportioned to its evaporative power. In this modification, the patentee has described his improvements as applied for the supply of a single boiler, but the arrangement is equally applicable for the uniform supply of a range of boilers. All the boilers are connected by means of water pipes, so that the water level is the same in all, and from the end boiler or any convenient one

Fig. 3. Fig. 4.





of the series, a water pipe is carried into a chamber or vessel, similar to the vessel, K, in the accompanying engravings. The upper part of this vessel is connected with the upper part of the boiler by means of a steam pipe, so that the vessel is in the same condition as regards the height of the water and the pressure of the steam as the boilers. A float is arranged in the vessel, the spindle of which is connected to a chain passing over a chain pulley, the other end of which chain is attached to the spindle of a valve, in the inlet valve box, which corresponds to the valve chamber, B, in the modification hereinbefore described. The other portion of the apparatus is in all respects a repetition of the arrangement delineated in the subjoined figures. With this arrangement it follows, that as the float in the vessel adjacent to the range of boilers sinks with the evaporation of the water, the valve in the first valve chamber is raised, and the water, from the source of supply, flows through the inlet pipe into the vessel, which corresponds to the vessel, K, in the accompanying engravings. The influx of water into the chamber, causes the float to rise, and the operations of opening and shutting the steam cock take place alternately, as before described. In this manner, the water throughout the range of boilers is maintained at a uniform height, and the feed water flows into the boilers in the same proportion as the evaporation takes place. This machinery or apparatus may also be used with advantage, in many cases, for raising water to elevated tanks, or from mines, so as to dispense with the usual pumping machinery employed for the purpose; there are also many other purposes to which this self-acting apparatus may be advantageously employed.

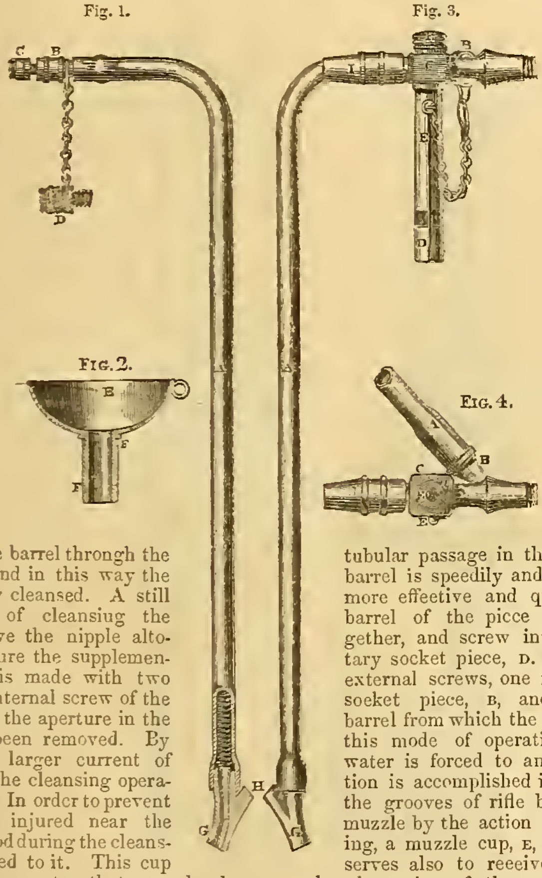
APPARATUS FOR CLEANING FIRE ARMS.

ALEXANDER HENRY, *Edinburgh—Patent dated February* 11, 1860.

THESE improvements relate to the arrangement and adaptation of a convenient apparatus for quickly and effectively washing out the interior of gun barrels, when such are fouled by the deposit of the gunpowder after continuous firing.

Fig. 1 of the accompanying engravings is an elevation, partially in section, showing one arrangement of the patentee's apparatus for cleansing fire arms; fig. 2 is a sectional elevation of the muzzle cap, which fits into the end of the barrel; fig. 3 is an elevation of a more complete apparatus; and fig. 4 is a plan corresponding to the upper part of fig. 3. The modification shown in fig. 1 consists of a piece of flexible or vulcanised India-rubber tubing, A, the upper end of which is fitted to a brass socket piece, B. This socket is made with an internal screw, to fit the external screw of the nipple, C. The free extremity of the tube, A, is placed in a vessel of water, the end of the ramrod is bound with a piece of cloth, so as to fit the barrel sufficiently tight to prevent, to some extent, the passage of air past it. With this arrangement, when the operator draws the ramrod up and down, the water in the vessel is caused to pass into and out

Fig. 1. Fig. 3. Fig. 2. Fig. 4.



of the barrel through the tubular passage in the nipple, and in this way the barrel is speedily and effectually cleansed. A still more effective and quicker way of cleansing the barrel of the piece is, to remove the nipple altogether, and screw into the aperture the supplementary socket piece, D. This part is made with two external screws, one fitting the internal screw of the socket piece, B, and the other the aperture in the barrel from which the nipple has been removed. By this mode of operating, a much larger current of water is forced to and fro, and the cleansing operation is accomplished in less time. In order to prevent the grooves of rifle barrels being injured near the muzzle by the action of the ramrod during the cleansing, a muzzle cup, E, fig. 3, is fitted to it. This cup serves also to receive any surplus water that may be drawn up by the action of the ramrod, and thus prevent its overflowing and soiling the barrel and lock of the piece. The cup, E, is formed of metal, but it may be made of India-rubber, wood, bone, or other suitable material, capable of being turned, or otherwise shaped, to the required figure. As delineated in the accompanying engravings, it has two circumferential grooves formed in the tubular part, in which are fitted two rings, F, of India-rubber; these rings are sufficiently thick to project a little beyond the metal of the tubular part of the cup. When the cup is placed in the muzzle of the barrel, the rings are compressed, and the cup is held firmly in its place, and at the same time the grooves of the rifle are completely protected from injury. If preferred, the whole of the tubular part of the cup may be covered with a piece of India-rubber tubing. In this apparatus provision is also made for the nipples, which are made smooth on the exterior. At the lower end of the tube, A, is fitted a brass or other metal socket, G, the extremity of which is hollowed to fit the smooth nipple. On the side of the socket piece, O, is formed a lateral projection, H, so that when the socket is placed on the nipple, the hammer or doghead is caused to rest upon this projecting part, and so retain the socket firmly in its place during the cleansing operation. Instead of the socket piece, G, it is preferred in some cases to fit to the end of the tube, A, a perforated cap or end piece, which being placed in the vessel containing the water for cleansing the gun, prevents the admission thereto of particles of dirt or foreign matter. The modification of the apparatus, as delineated in figs. 3 and 4, is designed to be still more useful than that shown in fig. 1. To the end of the flexible tube, A, is adapted the muzzle piece, B, which screws into the cross head, C, of the gun key, D. At the extremity of the cross head, C, is a screw which fits the nipple aperture in the barrel, or it may have adapted to it a socket piece similar to that shown at B, in fig. 1. The lower extremity of the key, D, is made box-ended, or with a square cavity for the ready removal of the nipple or other square-headed screws about the gun. To the box-ended extremity of the key, D, is also fitted, when required, a small turnscrew, for screwing in and removing the countersunk screws of the piece. At one end of the cross head, C, is a nipple primer, I, which screws on to the cross head; this primer is made tubular, and fits on to the nipple. The primer serves to contain a small quantity of fine powder to charge the nipple with, should the gun miss fire. The exterior of this primer may be notched or roughened, so as to form a jag to screw on to the small end of the ramrod, which, when bound with tow, serves as a cleanser for cleaning out the barrel. In front of the key, D, is a pricker, E, which is useful for pushing a little fine powder down the nipple primer, and into the tube of the nipple. The upper end of the key, D, has an internal screw formed in it, by means of which it may be attached to the end of the ramrod, and so serve as a handle thereto. The key, D, is squared externally at the upper part, and it fits a corresponding opening in the cross head, C; the two parts are secured together by means of the milled headed screw, F. The head of this screw has an internal screw formed in it which fits the end of the ramrod, and at the lower part is a steel screw for extracting bullets from the gun barrel. Thus, in this arrangement, the whole of the apparatus for cleansing the gun, and taking it apart, is combined in a very portable form, and so as to be always available.

WRITING DESKS AND APPURTENANCES.

JOHN GARNETT, *Windermere, Westmoreland.—Patent dated January* 7, 1860.

MR. GARNETT's invention relates more particularly to the internal arrangement or combination of fittings of travelling or portable and other writing desks, and also to an improved blotter, applicable generally for drying newly written documents, and consists partly of a means of keeping writing paper, envelopes, and other like articles of different sizes, compact and orderly in their places without liability to derangement from shaking, which it is proposed to accomplish by the employment of thin metal plates, connected freely at one end to vertical pins let into the sides of the desk, and having each a projection or lip at the opposite end, for the facility of raising them when inserting the paper in its place between the plates, the several plates being of a width corresponding to the various widths of paper and envelopes, and are placed one above the other with the smaller sizes uppermost, the whole of the plates being held together by elastic springs, so as to press the paper between them. These elastic springs in the form of bands or otherwise, are passed over the top plate and in an indentation or notch in its edges, thence under a wire loop, formed on the surface of the next lower and larger plate, the edge of which is notched or indented as before, to serve as a guide to the elastic bands, and so on throughout the entire series; one band by this means serving to hold the several sizes together, and keep the sheets of paper in their places laterally. A convenient box or case may be fitted in the desk for carrying in separate compartments, pens, stamps, and matches; the whole being covered by one lid, having a portion of its underside lined with sand-paper, for lighting the matches upon. Two small glass holders contained in leather cases with spring-hinged lids, and India-rubber caps, are also fitted into separate compartments, the one serving to contain ink, and the other liquid gum, this latter being reversed, or placed upside down, when not in use, so that the moist gum will lie upon the stopper or cap, and thereby prevent the mouth of the holder from being clogged up with dry or hardened gum. A further compartment is provided for pen holders, wax, pencils, gum brush, rubber, and other instruments requisite in writing, the lid of this box forming a rule or divided scale.

The writing pad, having a surface of leather or other suitable material, is fitted into the main lid of the desk, which forms a slope, when open, for writing upon. This pad is held in its place by two swivel buttons, and a space is left behind or underneath for containing large sized paper or letters. The blotter, which forms one of the fittings of the desk, consists of a number of sheets of blotting-paper cemented together at their edges by means of India-rubber solution, and fitted to a flexible back of leather, or other suitable flexible material, thus rendering the blotter perfectly flexible. This flexible blotter may, of course, be used generally in drying written documents without necessarily forming one of the fittings of the above described, or any other writing desk, and the same applies to the apparatus for holding note paper and envelopes.

As the use of this flexible blotter obviates the necessity for rubbing either the blotting paper, or the paper being written upon, by the application of the hand, the surfaces of both are prevented from becoming "greasy," in which state the ink would "run" upon the writing paper, and the blotting paper would cease to act freely as an absorbent of the spare fluid.

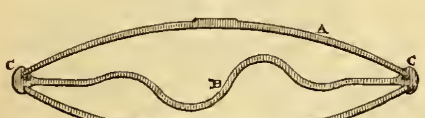
RAILWAY CARRIAGE SPRINGS.

P. G. Gardiner, *New York, U. S.—Patent dated 20th December*, 1859.

These improvements are adapted to certain peculiar constructions and arrangements of bearing springs for common road or railway carriages, whereby greater economy, simplicity of construction, and lightness are combined with increased elasticity. According to this invention two elliptic spring blades are combined with an elastic or extensible tension bar, the ends of the elliptic springs being confined in the heads or caps at the extremities of the intermediate tension bar. The heads or caps may either be formed in one piece with the tension bar, or fitted thereto by screws and nuts, or they may be grooved or slotted to receive the ends of the elliptic springs, or the caps may be fitted by means of screws and nuts to the ends of the tension bar, or the ends of the tension bar may be turned over, so as to form eyes into which the correspondingly turned ends of the elliptic springs are fitted, a bolt or rivet being passed through for the purpose of keeping them in their place. The tension bars may be of an undulating corrugated form in the middle part, or they may consist of a pair of elongated curved steel blades placed together with their curves outwards, but joining or meeting at the ends where screw threads are cut fitted with nuts for holding the caps.

Fig. 1 of the accompanying engravings represents a side view of the improved spring, with the ends of the elliptic blades, A, confined in caps or heads, C, fast on the intermediate tension bar, B; fig. 2 represents a side view of a spring with the exterior blades, A, confined in caps, D, to which the tension bar or bars, B, are secured by screws and nuts, E The two exterior blades or plates, A, are provided at the four corners with lugs or projections, forming on their ends recesses, which are rounded off to produce a curved edge. These plates are bent into an elongated or elliptic curve, each curve being similar; they taper slightly from the middle towards each end, and both are uniform in size and shape. B is the tension bar, bent in the middle part into a succession of curves or corrugations, so as to assume an undulated shape, and made a little thicker in the centre, tapering towards the ends gradually. At both ends of this tension bar an enlargement in the form of a cap or cross-piece, C and D, is provided, of the same width as the recesses between the projections on the ends of the blades, A. These heads or caps are curved or grooved to receive the ends of the blades, A, and when in their places they are prevented from sliding out by the said projections. In fig. 2, A, are the elliptic plates constructed in a similar manner to the plates, A, in fig. 1; D, are caps, the width of which is a little less than the recesses on the ends of the plates, A, between the projections, and by which the ends of exterior blades or plates, A, are confined in suitable grooves provided in the said caps; B is the tension bar composed of two steel plates, properly tempered, and bent into elongated curves in the middle, but joined together at their ends, where threads are cut and fitted with nuts, by which the whole spring is fastened together, the ends of the tension bar being passed through the caps, D. In another modification the tension bar is formed in the middle similar to the one represented in fig 1, but the ends of this tension bar are curved or turned over, and the ends of the exterior blades, A, are turned likewise to fit into the ends of the tension bar, and at the same time to form an eye for a bolt or rivet to pass through. The exterior blades or plates, A, and the ends of the tension bar are in this case made of the same width, and after the ends of the exterior blades or plates, A, are placed in the turned ends of the tension bar, bolts or rivets are put through the eyes formed in the ends of the blades, A, provided with large heads or washers, by which the ends of the exterior blades and the tension bars are kept together, and prevented from sliding out of place. The exterior blades, A, when first made and bent, are of such a length as to spread a little more than the distance between the caps or ends of the tension bar, and are then forced into the said grooves in the ends so as to fit tightly.

Fig. 1.



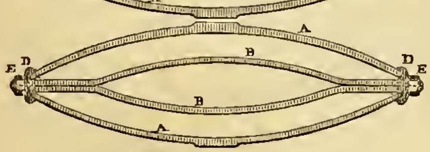


Fig. 2.

IMPROVEMENTS IN STEAM HAMMERS.

Joseph Rhodes, *Wakefield, Yorkshire.—Patent dated June* 8, 1860.

The accompanying engravings represent the arrangement of Mr. Rhodes' steam hammer. Fig. 1 is a side elevation of the machine, and fig. 2 is a front sectional elevation. A, is the main framing or standards; B, the hammer block, which is readily removeable to suit different work; C, is the head of the hammer affixed to the cylinder, D, which is capable of moving on the stationary piston, E, figs. 3, 4, affixed to and carried by the standards, A; F, is the passage for the steam to the piston, and G, the escape passage for the steam after it has done its work; H, is a slide valve by which the direction of the steam for action as well as for the escape is regulated. This valve, H, is connected to the rod, I, which passes through a stuffing-box at its upper end, where it is formed to receive one end of the lever, I, which turns upon a joint fixed near its centre, and at its other end is connected to the upper end of a pendent rod, the lower end of which is formed to receive the end, 1, of the lever, J, by which self-acting reversing motions to the slide valve are obtained in the following manner:—The lever, *j*, turns upon a centre, and the ends, 2 and 3, are capable of being alternately acted upon by the adjustable projection or wiper, K, affixed to the cylinder and moving with it. The lower end of the pendent rod is capable of moving along the arm, 1, of the lever, J, and of being set thereto at different distances by the set screw, 4, so as to vary the amount of leverage exerted, and the axis of the lever, J, is affixed to an eccentric piece, L, capable of turning in fixed bearings, and to which is affixed the lever, M, by which it is capable of motion in those bearings, to vary the position of the fulcrum of the lever, J. If desired, the valves may be operated by hand by removing the set screw, 4, and working the pendent lever by the handle affixed at its lower end. Fig. 2 is shown

Fig. 1.

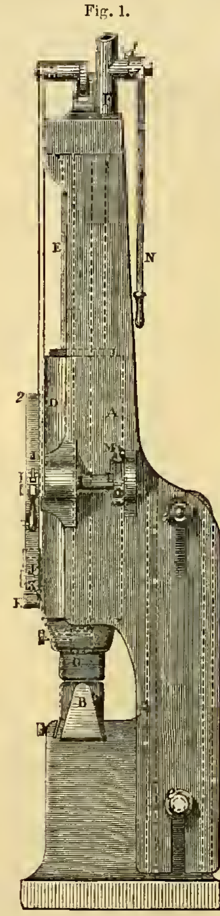
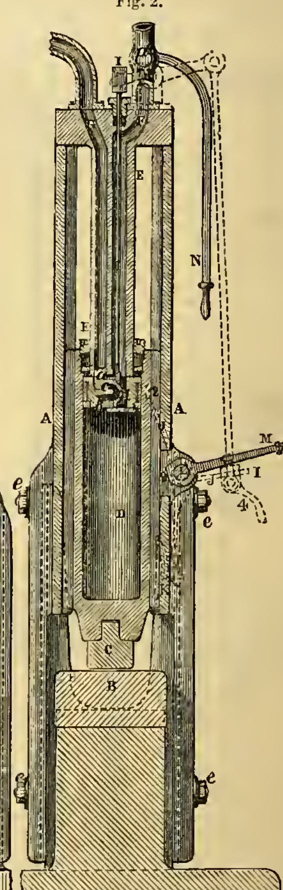


Fig. 2.



with the parts in the position for admitting the steam by the passage, *a*, to lift the cylinder with the hammer head, whilst the steam is escaping from the lower part of the cylinder by the passages, *b* and *c*; and to give force to the hammer head by the pressure of the steam, the valve will be reversed, as indicated by dotted lines, by the action of the projection or wiper, K, and then the steam will be admitted to the under side of the piston, E, to act upon the lower portion of the cylinder, D, and the steam above the piston in the cylinder, D, will escape by the passages, *a* and *c*, to the escape passage, G, and so on in succession.

Fig. 3.

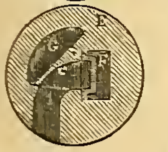


Fig. 4.

The standards, A, are each formed from the foundation of the hammer, *b*, in two parts fixed together, and capable of adjustment in relation to each other by screws to suit different quantities of metal to be operated upon; *d*, is the valve for shutting off the steam operated by the handle, *n*. Steam hammers thus constructed are very compact and powerful, rapid in their action, and specially adapted for light and heavy forging or smith's work, and are easily worked.

MANUFACTURE OF CAPSULES.

William Betts, *London.—Patent dated December* 9, 1859.

This invention consists in the manufacture of metallic capsules for bottles and other vessels of an improved construction, whereby a coloured trade mark or other design is produced upon such capsules, so that by means of a contrast of colours such trade mark or design is made conspicuous and more readily observable by the public. In manufacturing such capsules, the patentee substitutes what is called a spring die for the ordinary die now used in the manufacture. The spring dies for this purpose are so constructed by having a portion of the die made separately fitting into a cavity formed in the body of the die, and a spring being attached to the separate portion, so that when placed in the cavity and at rest it projects beyond the body of such die. In stamping the trade mark or design on the capsule, this projecting portion is first coloured, and then by forcing the capsule against the die in the mode usually adopted for stamping capsules, the projecting portion being slightly below the surface of the body of the die, a portion of the capsule corresponding with the shape of the projecting portion of the die will be raised and coloured by one operation. Spring dies may also be used in the manner and coloured as described in the specification of Mr. Bett's patent of the second of December, 1859, as well as in the ordinary stamping press; or the effect may be produced by stamping with an ordinary sunk die, having the required design engraved thereon, and afterwards colouring the design so raised, either by rollers or by hand, but the patentee prefers to do it in one operation. Capsules may also be manufactured according to this invention with portions in the shape of trade marks or other devices cut or punched out of the top or sides of such capsules; and, when necessary, there is placed under the part so cut or punched out coloured tin foil or other substance, so as to present a strong contrast to the surrounding or adjacent portion of such capsule. For hot countries where the trade mark is cut out it should not be on the top, as the protection from insects afforded to the cork by the capsule would thereby be endangered. As one of the great advantages in the use of the capsule is the assurance to the consumer that the capsuled bottle or jar is in the same state as it was when it left the manufacturing or bottling house whose name, device, or trade mark the capsule bears, this advantage is increased by the prominence given to the trade mark of the house, whereby it is quickly and easily recognized by the public in consequence of the strong contrast between such trade mark and the surrounding or adjacent portions of the capsule, and the manufacturer or bottler is also enabled more readily to detect fradulent imitations of his goods where the trade mark is on the side, a greater prominence can be given to the manufacturer or bottler's name on the top of the capsule.

BOILERS.

J. H. Johnson, *London and Glasgow* (J. Harrison, *Philadelphia, U.S.*) *Patent dated August* 30, 1859.

The object of this invention is to improve the mechanical structure of boilers, with a view to strengthen and facilitate their construction.

Fig. 1 of the accompanying engravings represents two different forms of the unit pieces, of which this boiler is formed when they are bolted together. Fig. 2 shows a front view of one form of boiler and its furnace partially in section, fitted up upon this principle, and built mainly of the second or double form of unit pieces. The first or simple unit piece, is of the form of a single globe, *a*, shown in section and detached at fig. 1; it has projections cast or formed above and below it, forming tubular openings, *b*, running into the globe with gently curved surfaces, the annular edges of the tubular parts being planed or turned truly, so as to make a steam tight joint when two or more are screwed tightly together, as at *c*, by the bolts, *d*. The form of units here shown bolted together are of the double globular figure connected by a lateral tube curved also into the globular part and shown in enlarged section at *e*, being a part about the water-level line, G H, of the pyramidal boiler shown at fig. 2. These unit pieces may be also formed of three or four globular pieces joined at right angles to each other, and in plan view forming either a square or two sides of a square as desired, or they may be formed with lateral annular tube joints also, and be bolted together side to side (or laterally), as well as on the top of each other (or vertically), by two bolts passing on each side of the upright bolt, *d*, as shown at *f*, fig. 1. At the end of each row, caps and nuts, *g*, are put on and screwed tightly up, thus making all the joints of the column of unit pieces through which the bolts, *d*, pass, quite secure and steam tight. These several forms of unit pieces are capable of being built into many other forms of boilers than that of the pyramidal one, and to suit almost any form of furnace or arrangement of heating flues desired. The globes are shown to a larger scale in section at fig. 1, for the purpose of illustrating the manner of putting them together. The washers, *g*, here represented are in the shape of a cup, the contour of which corresponds with the curved surfaces of the globes, increasing thereby the amount of heating surface. It will be seen that the water and steam connections as above described, and referred to in the engravings are made with vertical channels and horizontal joints. In addition to such channels it might be desirable in some cases to have the globes drawn together with bolts in a lateral as well as in a vertical direction, thereby connecting the globes by vertical as well as horizontal joints, as shown at *f*, fig 1. It is unnecessary, however, to multiply illustration as to the changes that may be made in the form of the boiler. It will be apparent that the unit pieces taken from one boiler may be used in another of a totally different form. In the event of an explosion the bursting of a single unit, affords an escape for the steam, making it impossible that explosions, destroying buildings and vessels by the sudden disengagement of large volumes of water and vapour, thereby scattering great masses of boiler material in every direction, should occur under this mode of construction. By unscrewing a few nuts, and removing the bolts, the whole structure may be readily taken down, or any unit may be removed for cleaning, repairing, replacing, or altering the surface exposed to the direct action of the fire. Thus, in a sea-going steamer, or indeed wherever sediment may be deposited, the whole range of unit pieces at the bottom may be removed in succession and replaced by clean ones, while the others are prepared for replacing at leisure, or the entire boiler may be removed, and a new one reconstructed from new pieces, without serious loss of time, if it is considered desirable to keep the units on hand for such purpose. The boiler may be set up on land, in places to which it would be difficult to transport one of ordinary construction, or in a vessel, and so avoid the necessity of having large openings to introduce it into its

Fig. 1.

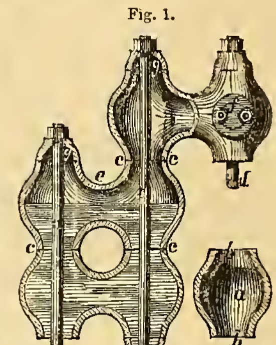
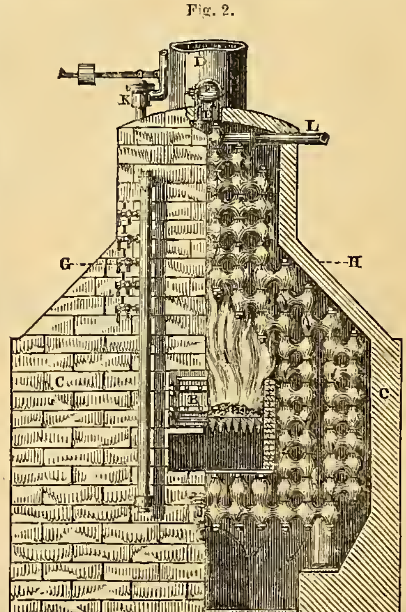


Fig. 2.



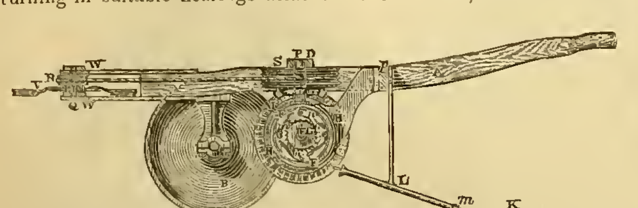
place, or requiring expensive machinery to place it in position. The parts of a boiler may be kept on hand, by manufacturers, to be used as required on the instant, or sold by dealers in units, or fractions of units. In this system the steam chamber is made in the same way as the rest of the boiler, and by a judicious arrangement and adjustment of the draught, the steam therein may be dried or surcharged at the discretion of the engineer. There are many ways in which boilers on this principle may be advantageously constructed or arranged at the option of the parties using it, but the patentee has shown in fig. 2, a form which has been adopted successfully. On referring to the figure, it will be seen that the units are arranged in double rows surrounding a fire chamber or furnace, A, the fuel supplied being through the fire door, B, the whole encased in brickwork, C. D, represents the chimney at the back of the furnace, and the current of the draught as well as its direction in passing to the chimney are shown by arrows. At the top of the casing is a small flue, E, with a damper, F; when this damper is opened a portion of the gases from the furnace will pass upwards, and thus on its way to the chimney, will dry or superheat the steam in that portion of the boiler above the water line, which is represented by the line, G H. The water is supplied to the boiler through the pipe and cock, J; at the bottom is a safety valve, and while the steam, K, passes off by the pipe, L, at the top. I, I, are the gauge cocks at the front of the furnace. Although the patentee prefers the globular form above described, yet the principle of construction involved in this invention is not dependent upon such forms, as other forms may be given to the unit of construction, which, while they are uniform and capable of being used in the construction of boilers of different dimensions and shapes, as above described, would, though in a less perfect manner accomplish the object the patentee has in view. The casing may be composed of cast or plate iron, the construction and arrangement of this secondary feature depending in a great measure upon the uses to which the boiler is to be applied, and the judgment of those erecting it. Although the patentee has described this invention as an improvement in the manner of constructing steam boilers, it is obvious that the same form of construction will answer as a condenser, or may be applied to the heating of water, or as a radiator for the warming of buildings.

MOTIVE POWER.

Louis Koch, *New York, U. S.—Patent dated November* 4, 1859.

These improvements relate to a peculiar arrangement and construction of mechanism for obtaining motive power, and consist in the application of the weight of a man or quadruped in stepping on bands, or their equivalent, as a cause of resistance against the propelling of any traveling machine, and thereby giving motion by the simple act of walking of the man or quadruped to the mechanism carried on the framework of the machine, such motion being obtained independently of the motion of the wheels on which the machine may be supported.

The subjoined engraving represents, in longitudinal vertical section, the tread power, as applied to a reaping machine. The frames, A, of the machine are supported by the running wheels, B. The back ends of the frames are bent slightly upwards so as to be conveniently held by the bands in propelling the machine forwards, or the same may be so arranged as to be attached to the upper part of the body by which means the hands of the operator are at perfect liberty. E is a shaft turning in suitable bearings attached to the frame, A. On this shaft



are fitted two drums, F, capable of turning freely on the same. On the sides of these drums are ratchet wheels G, which are firmly attached to the shaft, E, and are acted upon by pawls, N, secured to the drums, and so arranged that the turning of the drums in one direction, will by means of the pawls and ratchet wheels impart a rotatory motion to the shaft, E. There are two hollow boxes, H, fitted loosely on the shaft, E, which are kept in their proper places by being firmly attached to the transverse frame. These boxes, H, contain spiral springs secured at one end to the inner circumference of their box, and at the other end to their respective drums, F. The springs, pawls, and ratchet wheels, may either be placed on the outside or inside of the drums, F. Around the drums, F, bands, K, are wound; one end of each band being fastened to each drum, and the other end after passing through guides, L, is fastened to and supported by the cross-piece, P, and projects some distance on the ground where the same may be fastened to pieces of wood or metal to give them more stiffness. Projections, *m*, are attached to the bands to prevent the same being drawn through the guides, L, and to give the springs fast to the drum their proper tension. The operation of the machine is as follows:—The man having hold of the back part of the machine, and in the act of propelling or pushing the same forwards, places one foot on either of the bands on which the weight of his body will be thrown, and so hold the band, K, fast between his foot and the earth or ground, and unwinding thereby the corresponding band by the forward motion of the machine from the drum, F, at the same time turning the drum, F, which, through the connectious of the pawl, N, with the ratchet wheel, G, acts upon the shaft, E, so as to turn the same. The other foot then descends upon the other band, K, turning in the same manner the other drum, F, which likewise communicates its motion to the shaft, E, so as to turn the same. During this time one foot has been lifted off the first band, K, when the spiral spring in the corresponding box, H, and which is attached to the drum, F, as before mentioned, acts upon this drum, so as to turn the same in the opposite direction, winding thereby the band, K, again round the drum, and bringing the outer end of the band again near the end of the guide, L, until it is stopped by the projection, *m*, ready for the next forward step of the foot, when the same operation will be repeated, producing thereby a continued rotatory motion of the shaft, E, to be used for any desired purpose. In the machine represented in the drawing a wheel, M, is fastened on the shaft, E, in the centre of the machine between the boxes, H, which wheel gears with a pinion, N, attached to an upright spindle, P, supported on the top of the boxes, H, and in the cross stay piece, D. On the shaft or spindle, P, a drum or pulley, S, is firmly fixed. On the forward end of the machine plates or traverse frame pieces, W, are fastened to the frames, A, to support and carry upright spindles, Q, on which pulleys, R, are fastened, which are connected by bands with the drum or pulley, S, by which arrangement a rotatory motion is given to the spindles, Q. On the spindles, Q, discs are firmly attached, to which bent knives or blades are fastened by means of screws or bolts. The spindles are placed so near together, or the knives are made so long that the ends of the knives cross each other, but so as to work clear during their revolution. By reason of the inclined position of the machine when operating, the inclination of the knives or blades is downwards, and by the arrangement of curving the blades and making the cutting edge on the outer circumference of the same, a drawing and oblique cutting motion is produced on the grass or wheat, by which the process of mowing or reaping is much facilitated, and the power required reduced. Instead of using bands wound round the drums, as described, cords or chains may be used provided with proper pieces outside of the guide pieces for the foot of the operator to step on, or the ends of the bands or cords outside the guides, L, may be so constructed as to be fastened to the feet, moving in that case backwards and forwards therewith. Instead of passing bands or cords over drums or pulleys as above described the same may each be fastened to one end of a lever acted on by a spring so as to move the lever back again after the pressure of the foot and the weight of the body upon the end of the band have caused the same to be moved in one direction, while the machine is propelled forwards. These levers may be attached either to a shaft so as to communicate a rotatory motion to the same, or arranged so as to turn on a fulcrum to produce a longitudinal motion. Or instead of attaching the bands or cords to a drum placed on a shaft for the purpose of imparting a rotatory motion to the said shaft, or in lieu of fastening the bands, cords, or their equivalents to the end of levers to produce either a rotatory or a horizontal or longitudinal motion, as above described, the same may be attached to an inclined plane or wedge, upon which a roller or rollers are placed, which rollers will, by the pulling of the band or wedge, together with any weight which may be attached to the rollers, be raised upwards, producing thereby a power to be used for any desired purpose.

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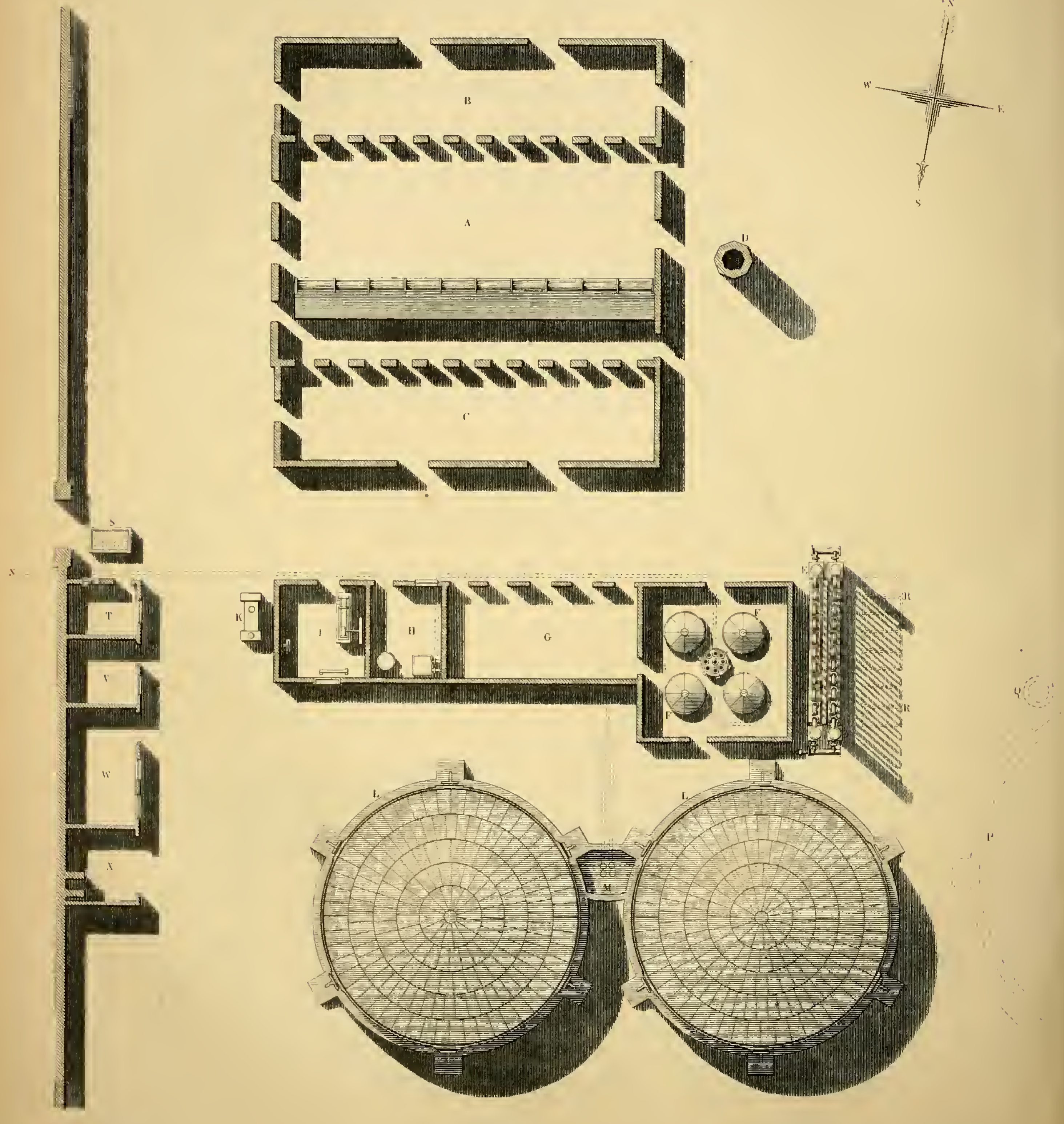
BUENOS AYRES GAS WORKS – GENERAL PLAN,

W. BRAGGE, ENGINEER.

E. T. BELLHOUSE & Cº MANCHESTER, CONTRACTORS.



BUENOS AYRES GAS WORKS.

(*Illustrated by Plate* 261.)

The general plan of the Buenos Ayres Gas Works completes our series of engravings on this subject. These illustrations comprehend the elevation and sectional views of the retorts, plate 205, vol. ii, second series, page 7; accompanying this plate is another, giving the elevation and plan of the condensers, plate 206; and at page 316, vol. iv, second series, plate 252, is given the elevation and plan for the purifiers.

The works have been arranged on the most approved plan, and with a view of meeting the increasing requirements of the business. The retort house is a capacious rectangular building, the central portion, A, of which is devoted to the series or "benches" of retorts, the arrangement of which are delineated in elevation and sectional views in plate 205. The end compartments, B and C, which run parallel with the central division, are set apart for coal stores. On the eastern side of the retort house is built the main chimney shaft, D, which is 85 feet in height. From the hydraulic main in the retort house the gas is conveyed by an underground main, the direction of which is indicated by the diagonal dotted lines, to the scrubbers and condensers. An elevation and plan of this part of the apparatus is given in plate 206. Adjoining the scrubbers and condensers is the purifier house, containing the purifiers, F, the arrangement and construction of which was delineated in plate 252. The purifiers are arranged in a building which opens into a large room, G, that serves as a lime shed and store. At the end of the lime shed is a room or compartment, H, forming the house for the main meter, and the gas governor; this important portion of the apparatus is thus completely isolated, and at the same time, is easy of access. The room, I, which forms the western extremity of the building, is set apart as an engine house and turning shop, which is fitted up with all the necessary requisities for renewing and keeping the whole of the apparatus in efficient working order. From the purifiers, the gas is conveyed by the gas mains, which are indicated by the dotted lines leading to the well, M, of the stand pipes, which are arranged between the gasometers, L. These gasometers are each eighty five feet in diameter, and have a rise of eighteen feet. The gas is conveyed from the gasometers into the city by a main supply pipe, N, which is twelve inches in diameter. At right angles to the range of buildings containing the purifiers, engine house, &c., is the boundary wall on the western side of the works, and at the gate is a weighing machine, S, which is placed just outside the lodge, T. Adjoining the lodge is a dwelling, V, for the gate keeper or other person in charge. A roomy and convenient workshop, W, is built beyond the dwelling house, and in the rear of this is the smithy, X. Provision is made in the works for the increasing demand for gas in Buenos Ayres; the dotted lines, P, Q, and R, indicate the position of an additional gasometer and purifiers. Orders have been sent to England for the necessary apparatus to increase the producing power of the works. The plant is altogether replete, with all the requirements for carrying on an extensive manufacture of gas, and its arrangement and construction reflect great credit on the engineer and contractors. The works are now under the management of Mr. Simpson, the engineer for the company, and from the last accounts we learn, that the jealousies which have existed between the English and natives in the management are dying away, and that the operations of the company are likely to be satisfactory in their results. We are rejoiced to hear of this, as well as the satisfactory progress which the company is making in extending the use of gas in the city of Buenos Ayres, for the superiority of this mode of lighting over other means of obtaining artificial light can hardly be sufficiently estimated.

LAW REPORTS OF PATENT CASES.

Carpet Power Looms: Talbot *v.* Crossley.—This case came on in the Vice-Chancellor's Court, before Vice-Chancellor Sir W. P. Wood, upon a motion for decree to restrain the defendants, Messrs. Crossley, machine makers, of Halifax, in the West Riding, from taking any further proceedings at law against the plaintiff under a deed of license of August, 1854, the bill being also filed for the purpose of setting aside such deed.

It appeared that in July, 1854, the plaintiff, who was a carpet manufacturer at Kidderminster, applied to the defendants as to the terms upon which they would supply him with power-looms for the manufacture of carpets. The defendants, after stating price, &c., replied that if the plaintiff had quite decided to have their looms he must call upon their solicitor, and request him to prepare a license, as that would be the first step. The defendants' solicitor sent a draught license, and subsequently, in the course of conversation with the plaintiff, told him that the grant of a license was a necessary and indispensable preliminary to his being furnished by the defendants with their power looms, which were protected by patents. The plaintiff executed the license in the full belief, according to the allegations in the bill, that he would not be bound or in any manner affected by it, unless he purchased and used the looms of the defendants. By the license, which was dated the 17th of August, 1854, and recited that the plaintiff admitted the validity of the patents and the title of the defendants, certain royalties were reserved to the defendants for all carpets made by the plaintiff by means of the patents the use of which was thereby granted to him. The bill proceeded to state that the plaintiff considered that by paying the cost of this license he had acquired the right to purchase and use the looms of the defendants, but that he had not agreed, and did not intend, without further consideration, to agree to buy such looms. As a matter of fact, he never did purchase any from the defendants, but in 1845 he bought 12 looms from Messrs Sharp, Stewart, & Co., which he had worked ever since. In July, 1858, the defendants served the plaintiff with a notice to inspect his machinery, and in the same month commenced an action for the recovery of £2000, claimed to be due from him for royalties under the deed of August, 1854. Some attempts were made to compromise the matter, but without success. In July 1859, the plaintiff presented a memorial to the Attorney-General, praying a writ of *scire facias*, for the purpose of cancelling one of the patents claimed by the defendants. The application was refused, and the action brought by the defendants was tried before Chief-Justice Cockburn, in December, 1859. The case was referred, and the arbitrator having determined that the plaintiff, Talbot, was stopped from disputing the validity of any of the patents comprehended in the license, assessed the damages at £955 8s. 10d. To restrain the defendants from entering upon judgment against him for this amount, the plaintiff had filed his bill, in which he charged that the license was executed only with a view to his purchasing and using power looms of the defendants, and that it was only part of an arrangement then under negotiation and never completed, and that it was not intended or contemplated on either side that the plaintiff should use any of the patent inventions of the defendants, or act under the license unless and until he had purchased and used their looms. The bill further charged that the deed of license was a surprise and fraud upon him, and ought to be declared void in equity and cancelled.

The Vice-Chancellor said that if the plaintiff had abandoned the license and insisted upon the arrangement being put an end to when he had made up his mind not to purchase looms from the defendants, his contest would have been intelligible. The defendants might, perhaps, have declined to accept back the license, and questions of grave importance might, in that view, have arisen. But the bill was not framed upon that footing. No such contest was raised, for the plaintiff retained the deed and never tendered its abandonment. The defendants were bound down by the license to a certain scale of royalties without any increase, whatever might have happened to enhance the value of their patents. They could bring no actions against the plaintiff for infringing those patents, nor for establishing a rival trade, and underselling their manufactures. His Honour after going through the facts of the case, and observing that the plaintiff had throughout admitted the deed and treated it as operative, but as only having effect from the time of his buying machines of the defendants, said that he could not allow the plaintiff to escape from his contract. The defendants assumed that when the plaintiff determined to accept the license he had made up his mind to take their machines. This was not a very irrational view, and he could not give effect to the contention urged by the plaintiff to the contrary. His Honour, after adverting to the delay of the plaintiff in filing his bill, said that for him now to talk of surprise and seek to be relieved from the contract on that ground, would be affording a latitude of escape from obligations unwarranted by any authority. The bill must be dismissed with costs.

Sewing Thread: Brook *v.* Evans.—This was a motion heard before Vice-Chancellor Stuart, for an injunction to restrain the plaintiffs from publishing, circulating, or distributing the report or statement of a motion for an injunction made to this Court in the cause on the 11th of July inst., which appeared in the *Leeds Mercury* of the 14th inst., or that the motion which was so made on the 11th inst., and upon which it was then ordered that the same should stand over with liberty to the plaintiffs to bring such action as they might be advised, and with liberty to the defendants to apply, might now be brought on for hearing. The object of the motion which was made on the 11th inst., and which was reported in the *Times* of the following day, was to restrain the defendants, who are manufacturers of cotton sewing thread at Derby, from selling any cotton sewing-thread by the name of "glacé" or "patent glacé" or having labels or wrappers with the words "glace" or "patent glace" thereon, those terms being claimed by the plantiffs, who are also manufacturers of cotton sewing-thread at Huddersfield, as their trade marks. The bill stated that in 1853 the plaintiffs invented a new mode of finishing and polishing thread, which invention they secured by letters patent, and the term "glace" or "patent glace" was adopted by them as their trade mark for that thread; that in 1855 they discovered that the defendants had begun to issue their thread under the name of "glace," and that they then remonstrated with the defendants on such use. The present bill, however, was not filed until the present year. Upon the occasion of the motion on the 11th inst., the Vice-Chancellor, without calling on the counsel for the defendants, said that as the plaintiffs admitted that they had known, so far back as 1855, of the alleged use by the defendants of the plaintiff's trade mark, and had not until now taken any steps to restrain such use, he should direct the motion to stand over, with liberty to the plaintiffs to bring such action as they might be advised in order to establish their right at law. The *Leeds Mercury* published a report of the motion on the 11th inst., which was afterwards printed as a handbill by the plaintiffs and circulated by them among the manufacturers and dealers in thread. That report contained the following sentence:—"It was established in evidence that the plaintiffs were the first to use the word 'glace' as applied to cotton sewing thread in this country, thereby appropriating and giving value to the word; and, although the defendants relied on the lapse of time as a defence to the motion and suit, yet the plaintiffs contended that that which was wrong in 1855 could not be right in 1859, and that the lapse of time should not affect the case, as the plaintiffs had not given any leave or license to the defendants to use the term, but constantly protested against it." The defendants complained of the publication of that sentence, inasmuch as it stated that it was established in evidence that the plaintiffs were the first to use the word, "glace," whereas the evidence was not gone into on the occasion of the motion on the 11th inst.

Mr. Malins, Mr. Elmsley and Mr. W. Morris, for the plaintiffs, were not called upon.

The Vice-Chancellor said that no doubt the Court would not permit the publication of any of its proceedings, where such publication amounted to a libel, and it would punish as for a contempt those who were guilty of so doing, and it would also restrain any publication which tended to prepossess or prejudice the public mind or obstruct the course of justice. The publication now complained of, however, contained nothing of that nature. Although the report was not perfectly accurate, there was no such impropriety in it as to justify the present motion, which must therefore be refused, but the costs must be costs in the cause, inasmuch as, if the plaintiffs were as much in the right as they stated themselves to be, they would obtain the costs as costs of the cause. The Vice-Chancellor added that he did not approve the publication, or say that it was a proper or fair report, but it was not every unfair report which the Court would punish.

The case was subsequently brought before the Lords Justices of appeal, when Lord Justice Knight Bruce said that the publication might be wise or unwise, full or not full, accurate or inaccurate, but he did not think it a case for an injunction. Lord Justice Turner concurred, and the appeal was dismissed; the costs to be costs in the cause, and be dealt with by the Vice-Chancellor.

Smoke Burning Furnaces: Prideaux *v.* M'Murray.—This was an action tried at Guildford, before Lord Chief Justice Cockburn and a special jury, for the recovery of £96, the balance for royalties and other charges in connection with a patent invention belonging to the plaintiff for the prevention of smoke. The defendant pleaded that the invention had failed, and on this ground the claim was resisted.

The plaintiff in this action had patented several inventions for the prevention of smoke in furnaces, and the defendant is a very extensive paper manufacturer, who carries on his business in Garratt Lane, Wandsworth. The defendant took possession of these premises in 1854, and had since expended a very large sum of money upon them, and it appeared that at the time he took possession one of the plaintiff's patented inventions was in operation, but was not found to succeed, and he tried several others without attaining the desired object. In the course of the year 1859 it seemed that the plaintiff had another patent, somewhat similar to the original one, but which was represented to be a great improvement upon it, and at the close of that year the defendant entered into a negotiation with him, the result of which was that the plaintiff's patent was applied to 11 furnaces in Mr. M'Murray's establishment in the beginning of the present year, and the plaintiff received £100 for the alteration. The invention appeared to consist in the application of doors to the furnaces, which were made something upon the principal of a Venetian blind, admitting a current of air when fuel was put in, and by this means causing the combustion of the smoke, the apertures closing of themselves when this result was obtained. It appeared, however, that they did not at all answer the purpose, and the defendant abandoned the use of them, and was compelled to use Welsh coal, which does not emit any smoke, but which is much more expensive than ordinary coal; and the payment of the present claim was resisted on the ground that the plaintiff had warranted that his invention would prevent smoke, and, as it had failed to effect that object, the defendant was not liable. The case on the part of the plaintiff was, firstly, that he never gave any such warranty; and secondly, that in point of fact the invention did carry out the object sought for, and that the failure in the present instance was owing to the mouths of the furnaces being too small. In support of this view of the case the original agreement for the alteration of the premises was put in, and it appeared that nothing was contained in it relating to the warranty, but the plaintiff was merely to make the alterations for a certain sum, and he himself deposed that he never gave any warranty of the kind suggested

The case on the part of the defendant was that the plaintiff, when he entered into the arrangement with Mr. M'Murray, guaranteed that the new invention should effect the object sought for, and that Mr M'Murray should never more be troubled with smoke, but it appeared that very soon after the new doors had been put to the furnaces the evil was as great as ever, and Mr. M'Murray was summoned to the Wandsworth police court by the Government inspector, and fined for not taking means to prevent smoke at his manufactory. It was also proved with regard to the allegation as to the mouths of the furnaces being too small to allow the new invention to act properly, that the plaintiff had the entire control of the alteration, and that the mouth could have been enlarged at a very small expense.

The Lord Chief Justice, in summing up, said that the only question the jury had to consider was, whether it had been established by the defendant that the plaintiff had warranted the invention to succeed in preventing smoke. Under ordinary circumstances when a person made use of a patented article he was supposed to be acquainted with its nature, and if it did not answer the purpose for which it was intended, he had no remedy. If, however, a warranty or guarantee was given that a certain object would be attained, and the invention failed in effecting that object, the patentee could not recover in an action of this description, and the defendant would be entitled to a verdict.

The jury said they were of opinion that no warranty had been given, and a verdict was therefore taken for the plaintiff for the amount sought to be recovered.

Steering Gear: M'Sweeney *v.* Douglass.—This was an action tried before Mr. Baron Wilde, to determine the question of the alleged infringement of the plaintiff's patent, for the invention of a steering barrel for steering ships. The invention consists of a kind of double screw or thread in the form of a barrel, around which to pass the tiller ropes attached to the wheel. Its effect is to increase the mechanical action of the pulleys, to prevent the ropes riding or overlapping, and to keep the ropes taut. The patent was nearly out by the lapse of time, when it was discovered that the defendant had for several years pirated and sold articles of a similar kind. The proof of the sale of one was given to establish the plaintiff's right of action. The defence was that it was an attorney's action got up for costs.

The jury found a verdict for the plaintiff for the nominal amount of damages proved, the real amount being the subject of further proceedings.

Hancock *v.* Bewley. Before the Lords Justices, August 4.—This was an appeal from a judgement of Vice-Chancellor Wood. In May, 1844, the plaintiff obtained a patent for the application of gutta percha, which had then been recently introduced into this country for the manufacture of corks, stoppers, and other articles. This patent was followed by others, in which the plaintiff together with other persons (including the defendants) was more or less interested. In order to carry into effect the experiments necessary for more effectually working these gutta-percha patents, premises were taken at Stratford, and experiments were made and the manufacture carried on under the direction of the plaintiff, who was, according to the case set up by the defendants, engaged at a salary, and not in any sense a partner. In October, 1846, an arrangement was entered into between the plaintiff and the defendant, Bewley, of the one part, and Messrs. Keene and Nickels, who were interested in these patents, of the other part, for a relinquishment by Keene and Nickels of their right to work the patent. This arrangement was carried out by an agreement dated the 2d of October, 1846, and referred to as agreement A. Another agreement of the same date, called agreement B, was made between Bewley and the plaintiff, by which, in consideration of a royalty to be paid to him, the plaintiff relinquished his right to work the patents, with a provision that Bewley might determine the agreement on giving six months' notice to the plaintiff. Upon the completion of this arrangement Bewley proceeded to carry on at the manufactory at Stratford, in partnership with other persons, under the title of the "Gutta-percha Company," the business established there for working the patents. The plaintiff was engaged by Bewley at a salary of £800 a-year, but disputes arose, and in August, 1848, the plaintiff was dismissed. In January, 1849, Bewley gave notice to the plaintiff of his determining agreement B, and also requiring him to concur in giving notice to Keene and Nickels to determine agreement A. Notice was also served upon the plaintiff dissolving any partnership, or supposed partnership with Bewley. Since this period the patents had been worked by Bewley and his partners on the one hand at the Stratford factory, while the plaintiff, in opposition to Bewley, had worked the patents on his own account at a rival manufactory, called the West Ham factory. Considerable litigation arose in reference to the matters in question and the patents, both those prior and those subsequent to the arrangement of October, 1846, and various transactions took place to which it is not necessary more materially to refer. The bill in the present suit was filed in 1857, and sought an account from the defendants of all profits made by the Gutta-percha Company, or the defendants Bewley and Barclay, by any manufacture or sale of gutta-percha under certain letters patent; to establish the plaintiff's right under an agreement of the 2d of October, 1846, and otherwise to a moiety of such profits, subject to payment of such royalty as ought to be paid by him, and generally to protect the interests of the plaintiff in respect of the patents. The case on behalf of the defendants, stated generally, was that they denied the existence of any partnership between the plaintiff and Bewley, and insisted that agreement A had been determined by the acts of the plaintiff, who had worked the patents since 1850 without offering to account, in direct opposition to, and with the endeavour to undersell, the Gutta-percha Company. The Lords Justices, in discussing the appeal, did not consider it necessary to decide any of the important points of law relating to the joint possession of patents, which had been raised during the argument.

Chimney Tops: Hagan *v.* Billing.—This was a motion in the Vice-Chancellor's Court, before Vice-Chancellor Sir R. T. Kindersley, for an injunction to restrain the defendant from making or selling chimney tops or pots in infringement of the patent obtained by the plaintiff about a year since. The defence was that the construction of chimney tops or pots with upright stays or partitions was not new, and if the defendant had been applied to by the plaintiff he would have removed them, not because it was an infringement, but to save litigation. The Vice-Chancellor sanctioned the motion standing over, with liberty to bring an action, the defendant keeping an account in the meantime.

Capsules—Betts *v.* Menzies—Exchequer Chamber, July 7.—The judgment of the Court on the plaintiff's appeal from the Court of Queen's Bench was given this day, and the result is, that the judgment of the Court below in the defendant's favour was affirmed, though not unanimously. The Lord Chief Baron, with Barons Martin, Channell, and Bramwell, and Mr. Justice Keating were of opinion, that it had been shown that the plaintiff's patent was bad from want of novelty; whilst Mr. Justice Williams and Mr. Justice Willes thought that nothing had appeared to deprive Mr. Betts of the benefit of his patent.

We understand that the plaintiff intends to appeal against this decision of the Exchequer Chamber to the House of Lords. The pertinacity with which the case is fought shows the value of the invention.

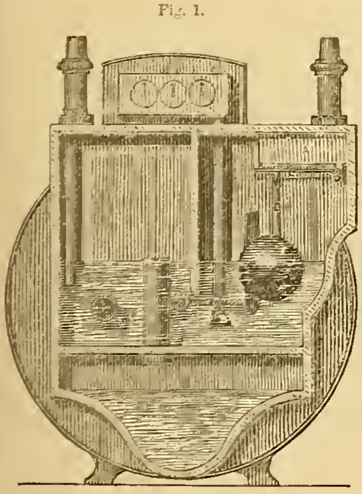
REGISTERED DESIGNS.

GAS METER.

Registered for Mr. Andrew Fullarton, *Edinburgh.*

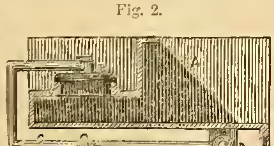
The purpose of utility to which the shape and configuration of Mr. Fullarton's design has reference, is, to admit of the gas passing freely through the valvular passage to the exit pipe, provided there is a proper supply of water in the meter. But if, from evaporation or other cause, the supply of water is below the proper level, the valve remains closed until more water is poured into the meter. The accompanying engravings represent the new parts of the design as arranged in a wet gas meter, and detached therefrom. Fig. 1 is a vertical section of the meter taken through the front box; fig. 2 is a vertical section of the valve box.

Fig. 1.



The front box, A, of the meter is partially divided into two chambers by the pendent partition, B, which dips down below the water. The gas enters the left hand chamber of the meter through the inlet pipe, C, and passes into the

Fig. 2.



measuring chamber by a branch from the overflow pipe, D. After being measured, the gas enters the right hand chamber by the aperture, E, and passes off by the valvular passage, F, in the valve box, G; this passage is controlled by the valve, H, which closes the passage in the direction of the egress of the gas. To the valve, H, is attached the bent lever, I, which is carried along beneath the valve box, and is centred upon a pin carried in small brackets pendent therefrom. To the lever, I, is connected the stem of the float, J, which, being sustained by the water, keeps the valve, H, open so long as the water is at the proper level, excess being prevented by the overflow pipe. When the water from any cause sinks below the proper level, the corresponding descent of the float closes the valvular passage, and prevents the emission of the gas through the exit pipe, K, until a further supply of water is poured into the meter.

REVIEWS OF NEW BOOKS.

Observations on Street Railways. By George Francis Train. Second Edition. London: Sampson Low & Co Liverpool: Holden. 1860.

This is a pamphlet by one of our 'cute Yankee cousins residing in England, who advocates the establishment, in the streets of our large towns, of tramways upon which carriages containing a considerable number of passengers will run All who are acquainted with the streets of London, must be well aware how desirable it is that some method of facilitating travel along them should be adopted. Here is the plan that seems most deserving of being carried out. If it be said that London streets are too narrow, hear what Mr Train says:—"London streets are wider than those of American cities. Ludgate Hill, and Cheapside are of course in your mind. But when we remember there are some 500 miles of streets in and about London adapted to this system, why select the narrowest to commence with? First construct a line from Bayswater, through Oxford Terrace and the New Road to the bank; then another line over Westminster Bridge, down those wide solitary streets on the Surrey side to London Bridge, with a branch over Waterloo to the Strand. This would relieve Fleet Street of a thousand omnibuses, and thus make way for a single line down the centre of the city to return by another route." In America they are said to have become a public utility, and they are in use in all the large cities on an extensive scale. In New York about thirty miles of tramways have been established, most of which is a double track. Some millions of dollars have been laid out upon them, and the passengers in 1858 amounted to nearly 27,000,000. The average speed per hour, including stoppages, is five miles. The fare for an adult is only 2½d. for the entire distance, and yet the dividends paid to the shareholders reached from 6 to 12 per cent. With such figures as these, there should be no hesitation in adopting the plan of horse tramways in England, and it is satisfactory to learn that Mr. Train has commenced operations at Birkenhead, with the view of testing the thing in a way that will convince the sceptical and secure the countenance of the wavering. We wish him every success, and hope to see very soon an extension of the plan to places where it is required far more urgently than at Birkenhead. In the pamphlet before us, which is illustrated by sketches, the author sums up the advantages of street railways on these terms:—

"1. Each railway car displaces two omnibuses and four horses, thus relieving the street of one of the main causes of the oft recurring lock-ups. 2. The wear and tear from these omnibuses being transferred to the rail, as well as that of many other vehicles that prefer the smooth surface of the iron to the uneven stone pavement, the rate-payers save a large per centage in taxes. 3. The gas and water commissioners are not inconvenienced when making repairs, as the rails are laid on longitudinal sleepers, which can be diverted in case of need; and as these cars, as well as carts and carriages that take the rail, move on a direct line, it is a self-constituted police system, saving confusion without expense to the public 4. The cars move faster than the omnibus, and so gentle is the motion, the passenger can read his journal without difficulty. 5. The rails are so constructed, that no inconvenience arises at crossings from wrenching off carriage wheels, and as the improved rail is nearly flat, even with the surface, and some five inches wide, no grooves impede the general traffic, and the gauge admits of all vehicles that prefer the track to the pavement. 6. The facility of getting in and out at each end of the car, and on each side, giving the passenger the choice of four places, together with the almost instantaneous stoppage by means of the patent brake, permits passengers to step in or out when in motion, without danger, instanced by the fact that nearly *thirty-five millions of passengers passed over the New York and Brooklyn roads last year, with only twelve accidents!* 7. In case of necessity, troops can be transported from one part of the city to the other at ten miles an hour. 8. It is a special boon to the working-man who, often in America, saves threepence beer-money, to buy a ticket from his work in the city to his cottage in the suburbs. In short, the street railway is as much a necessity as gas, sewerage, the steam rail, or the electric telegraph, and I challenge any one to refute the arguments in its favour herein advanced. Once introduced, you would miss the passenger car as much as any great public benefit. The advantages of this system, over that of the present omnibuses, are that you ride without jarring or jolting—in less time—with less confusion, less noise—with less fear of accident—less mud and dust, and with the additional luxury of more regularity, more attention, more comfort, more room, better light, better ventilation, and with a greater facility of ingress and egress."

The History and Properties of the Different Varieties of Natural Guanos. By J. C. Nesht. New edition. London: Rogerson & Tuxford. 1860.

A pamphlet of fifty pages, containing a great deal of information on guano, the natural manure which is now so largely imported for the use of farmers. Almost every kind of guano is here described with an analysis, and much useful advice is offered to agriculturists as to the purchase of an article which is often largely adulterated. It is a work which every buyer of this natural manure should possess. The following is the writer's account of the different varieties of guano:—

"The word guano is the term now applied commercially to all fœcal deposits of birds and marine animals, which, on different parts of the earth's surface, have been collected together in greater or less purity. The quality and value of these manures commercially depend almost wholly upon the amount of decomposition to which they have been subjected by the action of the atmosphere. The fœcal matter of these animals consists essentially of nitrogenous and phosphatic compounds. The ammoniacal portion of these deposits, with some of the phosphates, are, through the long continued action of rain and air, made tolerably soluble in water and are readily washed away. The phosphates of lime and magnesia are less soluble. In dry climates, where very little rain falls, as in some parts of Bolivia and Peru, on the western coast of South America, the dung deposited suffers very little from the action of the atmosphere, and retains nearly the whole of its soluble, nitrogenous, and phosphatic compounds. Guanos found in the regions where much rain falls lose the greater portion of their soluble ingredients. The residue is, however, often left rich in the phosphates of lime and magnesia. Many guanos are also much deteriorated by large quantities of sand being driven on to the deposits by the action of the winds. Guanos, from their composition, may naturally be divided into three classes—

"1st. Those which have suffered little by atmospheric action, and which retain nearly the whole of their original constituents, such as the Augamos and Peruvian guanos.

"2d. Those which have lost a considerable portion of their soluble ingredients. Of this class are the Schaboe, Bolivian, and Chilian guanos. They contain a sufficient quantity of nitrogen to distinguish them from the third series.

"3d. Those which have lost nearly all their ammonia and contain but little more than the earthy phosphates of the animal deposit. Many of these are largely contaminated with sand."

Terra-Voltaism. Remarks on the Application of a Terra-Voltaic Couple to Submarine Telegraphs. By Septimus Beardmore, C.E., Author of the "Globe Telegraph." London: Stanford. 1860.

This pamphlet is to be looked upon as a report on the progress of a scheme, which, if it can be worked out, will be of very great value in the rapid transformation of intelligence from place to place by the aid of electricity.

The principle of terra-voltaism, or the action of a terra-voltaic couple, is shown by means of metals of different nature placed in electrolytic connection with the earth. Thus, if a piece of zinc is placed at one end of a garden, and a piece of copper at the other, and the two metals are connected by an insulated wire with the terminals of a galvanometer, the needle will be deflected.

"So far as one medium, the earth, is concerned (says the Author), it is not of the slightest consequence whether these pieces of zinc and copper are at each end of his garden or 1000 miles apart; for such is the nature of the earth, its great bulk making up for its otherwise inferior conductibility, that there is no resistance on its part, but the conditions of the insulated wire referred to very much affect the electric-motive force developed by the zinc and copper; it then becomes necessary when the wire is very long and thin, to make use of a terra-voltaic pair which exhibit a still greater power. Zinc-platinum does this, the former being immersed in sulphuric acid, and the latter in pure nitric acid, forming, when insulated from the earth in the form of a local battery, the well-known "Grove's pair." This pair, however, is not sufficiently powerful to overcome the resistance afforded by a wire of extreme length and small diameter, but it becomes necessary to seek for some other voltaic couple, the elements of which will singly afford still greater electro-motive force. This may be found in an amalgam of potassium for the positive metal, acted on by dilute sulphuric acid, and platinised graphite for the negative element, immersed in a solution of bi-chromate of potass and sulphuric acid. But the practical objection to the use of this is found in the extreme cost of the potassium. Fortunately there is another metal, sodium, almost as good, which in consequence of its increased use in the manufacture of aluminium, has become much cheaper, and may be had at a price which renders it available for telegraph purposes. This metal is easily arranged in porous pots in the earth, and as a terra-voltaic pair sodium-graphite will give a force sufficient for any lines hitherto constructed."

The theoretical points affecting telegraphs, worked by means of a terra-voltaic couple, are thus summed up by Mr. Beardmore:—

"1. The larger the diameter of an insulated wire, the less resistance is met with, and the easier signals are transmitted. 2. The earth offers no resistance to the passage of a current generated by plates of dissimilar metal placed in electrolytic connection with the earth. 3. Insulation is the protection of the line-wire from free electric contact with the earth or water. As opposed to intense currents there is in practice no such thing as perfect insulation, but with currents of low intensity, applied with a terra-voltaic pair, it is not difficult to make and maintain sufficient insulation. 4. Electrical induction, that is, static induction, goes on as the square of the tension of the inducing charge: other things remaining the same. (Hearder). 5. A coil, consisting of a single turn of thick wire will be very sensitive to a dynamic current of low intensity, whilst it will scarcely be affected with one of high static intensity; and, *vice versa*, a long coil of very fine wire will be sensitive to a current of high statical intensity, which is scarcely influenced by an extremely low dynamic current. (Hearder). 6. 'Quantity' electricity is the useful power for affecting a telegraphic instrument. 'Intensity' is chiefly wanted to overcome resistance in the wires on the present system. If resistance is done away with, it is obvious that, 'intensity' is only wanted to deal with the mechanical arrangement of the telegraph instrument."

Mr. Beardmore then describes the first practical trials which were carried out in February last, between Cromer and Heligoland, to which latter place he had previously despatched four plates of zinc, that were placed in sawdust in the earth saturated with dilute sulphuric acid. These plates measured each 100 square inches, and there was therefore a surface of 400 square inches, or about 2·75 square feet in electrolytic connection with the earth.

"On arriving at Cromer I placed four plates of platinised graphite of a similar size in the earth, and from time to time poured into the earth around them a highly oxygenated solution. At another spot in the ground I placed nine porous cells into which I poured a similar solution, and into each of these a piece of platinised graphite in the form of a cylinder, presenting a surface equal to 18 square inches, in all 162 square inches, or about 1·20 square feet. The distance by wire between Heligoland and Cromer may be estimated at about 300 miles direct, and by cable and land-wire 320 of the former and 9 of the latter. There were three wires in the cable, the gauge of each being No. 16; the gauge of the land-wire, No 8. *February* 19, 1860.—In the first instance directions were given to Heligoland to join up the zincs in the earth with one of their galvanometers attached to one of the wires of the cable, and we made and broke with my graphites first with the four in the earth, and then with the small surface, 162 square inches, in the cells; but on inquiring in the usual way, we learned that they had observed no deflections. (No observations can be made on this result, as I am not aware, up to this moment, what description of galvanometer was used at Heligoland, and on this alone would the useful character of the current depend.) The instructions then were that the superintendent at Heligoland should send a message to be received on my galvanometer, which was joined up to the graphites in the cells. The "stops" of the instrument were not put forward, and the readings were therefore by no means clear, yet still a word or two could be recognised, and the result of the trial, inasmuch as with these small means certain deflections were obtained, was extremely satisfactory. The superintendent at Heligoland then sent with one zinc, = 100 square inches, and the needle went over to 20°, but the force was not strong, and Heligoland being told to insulate his wire, the needle went back to zero, showing that the currents evolved by one plate of zinc of 100 square inches, and one plate of graphite of 162 square inches were sufficient, although 300 miles apart, to deflect the galvanometer 20°. This result, although not settling the question finally, was interesting, inasmuch as it first practically showed that the effect of a terra-voltaic couple in the earth is in no way influenced by the distance the metals may be placed apart. Again, Heligoland made and broke with two zincs, = 240 square inches, and we received steady and regular deflections, my galvanometer being joined to the 162 square inches of graphite in the cells. We then joined up a Siemens' instrument in the Cromer office, but the power was not sufficient to work it. On Heligoland sending through two wires of the cable, the galvanometer attached to the Siemens' instrument was well deflected, but the instrument itself not worked. After a lapse of some time I requested Heligoland to send with two zincs, using the three wires of the cable as one, when we again observed strong deflections on my galvonometer, but neither Siemens' instrument nor a relay of Henley's were worked; the latter, although very delicate, appearing to have induced in it a permanent form of magnetism, which prevented the needle recovering itself to its natural condition. In this latter case we observed no difference whether the 1·12 square feet of surface in the cells or the 2·75 square feet in the earth were used. I have noted above the general results obtained, but I must not omit the very satisfactory trial as to the force developed by the terra-voltaic pair (240 square inches zinc and 162 square inches graphite) when applied to the wires of the cable singly and in connection with each other. With one wire we obtained 15°; with two wires, 40°; with three wires, 50° on the galvanometer. With a vertical galvanometer it will be seen that the value of the deflection of 10° (40° to 50°) was fully equal to the others (0 to 15° and 15° to 40°), and the fact that diminished resistance on the part of the wire is alone requisite to get a useful power, was satisfactorily established by practical trial, for with separate wires joined up as one, the induction, which would have been manifest had they been operated on by ordinary batteries, did not present itself, and in no way influenced the value of the force obtained. In the month of May of the present year a fresh experiment was made between Heligoland and London, the terra-voltaic couple used being 2·75 square feet zinc in dilute sulphuric acid in the earth at Heligoland, and 1·75 square feet carbon in dilute sulphuric acid and bichromate of potash in the earth at Islington; distance between them about 450 miles. Through the kindness of Mr. Tyer, the engineer to the London District Telegraph Company, I was enabled to use one of the wires from the station at the latter place to Threadneedle Street; and, connecting this with the land-wire from Cromer, which again was connected up with one of the submarine wires from Heligoland, I formed a perfect voltaic circle. The resistance however, of the wire (320 No. 16 copper and 150 No. 8 iron) was so great that the deflections were faint, although palpable. A few days afterwards, with the same voltaic arrangement, but with all three submarine and all three land-wires joined up as one, we obtained deflections quite clear and distinct, the operator at Heligoland sending us the letters of the alphabet in succession, at a rate equal, in the opinion of a gentleman in the London office, to about six words per minute on the Morse system, which would have been duly recorded but for an accident to my relay instrument. It will be objected to these results that they were performed with three wires instead of one; but in answer to this I would observe—first, that under the present system no attempt is made to work one line throughout, but a relay at Cromer starts a current from a fresh battery;—second, that the voltaic couple used was zinc-graphite, which gives *half the electro-motive force* of sodium-graphite, which would be used in practice;—third, that a line of 320 miles, No. 16 copper wire, offers in itself sufficient resistance to justify us in judging the results obtained in February (detailed at page 30) to be our guide rather than that made in May, when the additional resistance of 150 miles land-wire was added. Even with this sodium-graphite, if it had been convenient to use it for this experiment would have been of sufficient tension to overcome the resistance;—fourth, I would lay stress on the important fact that with three insulated wires joined up as one, the effects of induction would have been manifest if this system gave rise to them; but I obtained all the benefit of the increased conduction without the usual induced currents making themselves visible in the slightest degree. It will be in the recollection of those who have followed this subject up during the past few years, that one of the causes of the great error of making the conductor of the old Atlantic cable so small, arose from a trial made by Mr. Whitehouse of several separate insulated wires joined up as one, and that the tests for speed gave a result favourable to the one wire by itself; and it was too hastily concluded therefrom that a small wire was better than a large one, the large inductive effects due to the separate dielectrics being overlooked. Now, here we have this unfavourable state of things *aiding* us in one important condition, and raising up no new obstacle to success."

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

THE BRITISH ASSOCIATION AT OXFORD, 1860.

The following is a list of the papers read, with a resumé of the more interesting ones:—

SECTION A.—MATHEMATICAL AND PHYSICAL SECTION.

"Report on observations of luminous meteors for 1859-60," by the late Prof. Baden Powell, prepared by Mr. J. Glaisher.

"On the velocity of earthquake shocks in the laterite of India," by Mr. J. Brown.

"On the magnetism of certain Indian granites," by Mr. J. A. Brown.

"On meteorological observations for 1859, made at Huggate, Yorkshire, East Riding," by the Rev. T. Rankin.

"On the different motions of electric fluid," by the Rev. T. Rankin.

"On the trisection of an angle," by Mr. P. Cody.

"On the principles of the solar camera," by Mr. A. Claudet.

The solar camera, invented by Woodward, is one of the most important improvements introduced in the art of photography since its discovery. By its means small negatives may produce pictures magnified to any extent; a portrait taken on a collodion plate not larger than a visiting card can be increased, in the greatest perfection, to the size of nature; views as small as those for the stereoscope can be also considerably enlarged. This is an immense advantage, which is easily understood when we consider how much quicker and in better proportion of perspective small pictures are taken by the camera obscura, while the manipulation is so greatly simplified. There is nothing new in the enlargement of photographic pictures. This has been done long ago simply by attending to the law of conjugate foci; and every photographer has always been enabled, with his common camera, to increase or reduce the size of any image. For the enlargement, it was only necessary to place the original very near the camera, and to increase in proportion the focal distance. But the more the focal distance was increased, the more the intensity of light was reduced; and a still greater loss of light arose from the necessity of diminishing the aperture of the lens, in order to avoid the spherical abberation. Such conditions rendered the operation so long that it became almost an impossibility to produce any satisfactory results when the picture was to be considerably enlarged. For these reasons, it naturally occurred, that if the negative, having its shadows perfectly transparent and its lights quite black, was turned against the strong light of the sun, its positive image at the focus of the camera would be so intense that the time of exposure would be considerably reduced. So that, in order to employ the light of the sun, and follow easily its position without having to move constantly the whole camera, it was thought advisable to employ a moveable reflecting mirror, sending the parallel rays of the sun on a vertical plano-convex lens condensing those rays on the negative, placed before the object glass, and behind the condenser, somewhere in its luminous cone. Many contrivances for this object were resorted to, but without considering anything else than throwing the strongest light possible on the negative to be copied. The constructors of these solar cameras never thought it very important to consider whether the focus of the condensing lens was better to fall before or behind the front of the object glass, provided the negative was placed in the luminous cone of the condenser. This want of attention has been the cause which has made the solar camera a very imperfect instrument for copying negatives. The beautiful principle of Woodward's apparatus consists in his having decided the question of the position of the focus of the condenser, and in having placed it exactly on the front lens of the camera obscura. As this principle had not yet been explained when the invention was exhibited before the Photographic Societies of London and Paris, and not even by the inventor himself in the specification of his patent, Mr. Claudet has undertaken, in the interest of the photographic art, to bring the subject before the British Association, and to demonstrate that the solar camera of Woodward has solved the most difficult problem of the optics of photography, and is capable of producing wonderful results. This problem consists in forming the image of the negative to be copied only by the centre of the object-glass reduced to the smallest aperture possible, without losing the least proportion of the light illuminating the negative. The solar camera does not require any diaphragm to reduce the aperture of the lens, because every one of the points of the negative are visible only when they are defined on the image of the sun, and they are so (in that position exclusively), for the centre of the lens is the only point which sees the sun, while the various points of the negative which form the marginal zone of the lens, are defined against the comparatively obscure parts of the sky surrounding the sun—are, as it were, invisible to that zone; so that the image is produced only by the central rays, and not in the least degree by any other points of the lens, which are subject to spherical aberration. It is, in fact, a lens reduced to an aperture as small as is the image of the sun upon its surface, without the necessity of any diaphragm, and admitting the whole light of the sun after it has been condensed upon the various separate points of the negative. It is evident that from the centre of the lens the whole negative has for background the sun itself, and from the other points of the lens it has for background only the sky surrounding the sun, which fortunately has no effect in the formation of the image. Such is the essential principle of Woodward's solar camera, which did not exist in that instrument when the focus of the condenser was not on the object-glass. This principle is truly marvellous, but it must be observed that the solar camera, precisely on account of the excellence of this principle, requires the greatest precision in its construction. For its delicate performances, it must be as perfect as an astronomical instrument, which, in fact, it is. The reflecting mirror should be plane, and with parallel surfaces, in order to reflect on the condenser an image of the sun without deformation; and in order to keep the image always on the very centre of the object-glass, the only condition for the exclusion of the oblique rays, the mirror should be capable by its connection with a heliostat of following the movements of the sun. The condenser itself should be achromatic, in order to refract the image of the sun without dispersion, and to define more correctly the lines of the negative; and a no less important condition for losing nothing of the photogenic rays would be, to have it formed with a glass perfectly homogenous and colourless. With such improvements, the solar camera will become capable of producing results of the greatest beauty; and, without any question, its introduction into the photographer's studio will mark a period of considerable improvement in the art.

"On the means of increasing the angle of binocular instruments in order to obtain a stereoscopic effect in proportion to their magnifying power," by Mr. A. Claudet.

In a paper on the stereoscope which Mr. Claudet read before the Society of Arts in the year 1852, alluding to the reduction of the stereoscopic effect produced by opera-glasses on account of their magnifying power, he stated that, in order to redress that defect, it would be necessary to increase the angle of the two perspectives. This he proposed to do by adapting to the object-glasses two sets of reflecting prisms, which by the greater separation given to the two lines of perspectives, would reflect on the optic axes images taken at a greater angle than the angle of natural vision. Such was the instrument that Mr. Claudet submitted to the British Association, to prove, as he has always endeavoured to demonstrate in various memoirs, that the binocular angle of stereoscopic pictures must be in proportion to the ultimate size of the pictures on the retina, larger than the natural angle when the images are magnified, and smaller when they are diminished; which, in fact, is nothing more than to give or restore to these images the natural angle at which the objects are seen when we approach them or recede from them. For magnifying or diminishing the size of objects is the same thing as approaching them or receding from them, and in these cases the angles of perspectives cannot be the same. Mr. Claudet showed that, looking at the various rows of persons composing the audience, with the large ends of the opera-glass, all the various rows appeared too close to one another, that there was not between them the distance which separates them when we look with the eyes alone; and he showed also that, with the small end, the distance appeared considerably exaggerated. But, applying the sets of prisms to the opera-glass in order to increase the angle of the two perspectives, then looking at the audience as before, it appeared that the various rows of persons had between them the natural distance expected for the size of the image or for the reduction of the distance of the objects. By applying the two sets of prisms before the eyes without the opera-glass, it was observed, as was to be expected, that the stereoscopic effect was considerably exaggerated because the binocular angle was increased without magnifying the objects. But looking with the two sets of prisms alone at distant objects, the exaggeration of perspective did not produce an unpleasant effect. It appeared as if we were looking at a small model of the objects brought near the observer. By the same reason, stereoscopic pictures of distant objects (avoiding to include in them near objects) can advantageously be taken at a larger angle than the natural angle, in order to give them the relief of which they are deprived as much when we look at them with the eyes, as when we look only with one eye; instead of being a defect it seems that it is an improvement. In fact, the stereoscope gives us two eyes to see pictures of distant objects.

"On British storms, illustrated with large diagrams and charts," by Admiral Fitzroy.

"General abstract of the results of Messrs. de Schlagentweit's magnetic survey of India, with three charts," by M. H. von Schlagentweit.

"On a magnetic survey of the west coast of India," by Mr. J. A. Broun.

"Observations on the meteorological phenomena of the vernal equinoctial week," by Mr. Du Boolay.

"On some optical illusions connected with the inversion of perspective," by Sir D. Brewster.

The term "inversion of perspective" has been applied to a class of optical illusions, well known and easily explained, in which depressions are turned into elevations, and elevations into depressions. One of the most remarkable cases of this kind, which has not yet been explained, presented itself to the late Lady Georgiana Wolf, and has been recorded by her husband, Dr. Wolf. When she was riding on a sand-beach in Egypt, all the footprints of horses appeared as elevations, in place of depressions, in the sand. No particulars are mentioned, in reference to the place of the sun, or the nature of the surrounding objects, to enable us to form any conjecture respecting the cause of this phenomenon. Having often tried to see this illusion, I was some time ago so fortunate as not only to observe it myself, but to show it to others. In walking along the west sands of St. Andrews, the footprints, both of men and of horses, appeared as elevations. In a short time they sank into depressions, and subsequently rose into elevations. The sun was at this time not very far from the horizon, on the right hand; and on the left there were large waves of the sea breaking into very bright foam. The only explanation which occurred to me was, that the illusion appeared when the observer supposed that the footprints were illuminated with the light of the breakers, and not by the sun. Having, however, more recently observed the phenomenon, when the sun was very high on the right, and the breakers on the left very distant, and consequently very faint, I could not consider the preceding explanation as well founded. Upon attending to the circumstances under which they were now seen, I observed that the human footprints were all covered with dry sand that had been blown into them, so that they were much brighter than the surrounding sand, and the dark side of the impression next the sun; and hence it is probable that they appeared to be nearer the eye than the dark sand in which they were formed, and consequently elevations. After repeated examinations of them, I found the footprints appeared as elevations as far as the eye could see them; and they were equally visible with one or both eyes. But whenever the eye rested for a little while on the nearest footprint, it resumed its natural concavity. I have observed other illusions of this kind, which are more easily explained, though they differ from any hitherto described. In the Church of Sant Agostino in Rome, there is above each arch a painted festoon suspended on two short pillars; but, instead of appearing in relief, as the painter intended, by shading the one side of them, they appeared concave, like an intaglio. In other positions in the church they rose into relief. Upon a subsequent visit to the church, I found that the festoon, or suspended wreath, was concave when it was illuminated—or rather when the observer saw that it was illuminated—by a window beneath it, and in relief when the eye saw that it was illuminated by a window above it, the object being similarly illuminated in both cases. In the common cases of inverted perspective, the eye is deceived by looking at the inversion of the shadow in the cameo or intaglio itself; but in the present case the eye is deceived by perceiving that the body-painting, supposed to be in relief, is illuminated by a light either above or below it. An optical illusion of a different kind presented itself to me in the Church of Santa Giustina at Padua. Upon entering the church we see three cupolas. The one beneath which we stood appeared very shallow; the next appeared much deeper, and the third, deeper still. They were all, however, of the same depth, as we ascertained by placing ourselves under each in succession, and observing that it was always the shallowest.

"On the chromatic properties of the electric light of mercury," by Dr. Gladstone.

"On his own perception of colours," by Dr. Gladstone.

"On the communication of meteorological observations by Alpine travellers," by Mr. Ball.

"On the velocity of the sound of thunder," by the Rev. S. Earnshaw.

"Report of committee appointed to prepare a self-recording atmospheric electrometer for Kew, and portable apparatus for obtaining atmospheric electricity," by Prof. W. Thomson.

Your committee, acting according to your instructions, applied to the Royal Society for £100 out of the Government grant for scientific investigation, to be applied to the above-mentioned objects. This application was acceded to, and the construction of the apparatus was proceeded with. The progress was necessarily slow, in consequence of the numerous experiments required to find convenient places for the different instruments, and arrangements to be made. An improved portable electrometer was first completed, and is now in a form which, it is confidently hoped, will be found convenient for general use by travellers, and for electrical observation from balloons. A house electrometer on a similar plan, but of greater sensibility and accuracy, was also constructed. Three instruments of this kind have been made, one of which (imperfect, but sufficiently convenient and exact for ordinary work) is now in constant use for atmospheric observation in the laboratory of the natural philosophy class in the University of Glasgow. The two others are considerably improved, and promise great ease, accuracy, and sensibility for atmospheric observation, and for a large variety of electrometric researches. Many trials of the water-dropping collector, described at the last meeting of the Association, were also made, and convenient practical forms of the different parts of the apparatus have been planned and executed. A reflecting electrometer was last completed, in a working form, and, along with a water-dropping collector and one of the improved common house electrometers, was deposited at Kew, on the 19th of May. A piece of clock-work supplied by the Kew committee, completes the apparatus required for establishing the self-recording system, with the exception of the merely photographic part. It is hoped that this will be completed, under the direction of Mr Stewart, and the observations of atmospheric electricity commenced in little more than a month from the present time. In the mean time preparations for observing the solar eclipse, and the construction of magnetic instruments for the Dutch Government, necessarily occupy the staff of the observatory, to the exclusion of other undertakings. It is intended that the remaining one of the ordinary house electrometers, with a water-dropping collector, and the portable electrometer referred to above, will be used during the summer months for observation of atmospheric electricity in the Island of Arran. Your committee were desirous of supplying portable apparatus to Prof. Everett, of Windsor, Nova Scotia, and to Mr. Sandiman, of the Colonial observatory of Demerara, for the observation of atmospheric electricity in those localities; but it is not known whether the money which has been granted will suffice, after the expenses yet to be incurred in establishing the apparatus at Kew shall have been defrayed. In conclusion, it is recommended to you for your consideration by your committee, whether you will not immediately take steps to secure careful and extensive observations in this most important and hitherto imperfectly investigated branch of meteorological science. For this purpose it is suggested,—1. That, if possible, funds should be provided to supply competent observers in different parts of the world with the apparatus necessary for making precise and comparable observations in absolute measure; and,—2. That before the conclusion of the present summer a commencement of electrical observation from balloons should be made.

"Results of self-registering hydrometers," by Mr. E. Vivian.

"On the relation, between hyperconics and elliptic integrals," by the Rev. Dr. Booth.

"On the forms of certain lunar craters indicative of a peculiar degrading force," by Mr. W. R. Birt.

"On atmospheric waves, with diagrams," by Mr. W. R. Birt.

"On microscopic vision, and a new form of microscope," by Sir D. Brewster.

In studying the influence of aperture on the images of bodies as formed in the camera, by lenses or mirrors, it occurred to me that in microscopic vision it might exercise a still more injurious influence. Opticians have recently exerted their skill in producing achromatic object-glasses for the microscope with large angles of aperture. In 1848 the late distinguished optician, Mr. Andrew Ross, asserted "that 135° was the largest angular pencil that could be passed through a microscopic object-glass," and yet in 1855 he had increased it to 170°! while some observers speak of angular apertures of 175°. In considering the influence of aperture, we shall suppose that an achromatic object-glass with an angle of aperture of 170° is optically perfect, representing every object without colour and without spherical aberration; when the microscopic object is a cube, we shall see five of its faces, and when it is a sphere or a cylinder, we shall see nine-tenths or more of its circumference. How then does it happen that large apertures exhibit objects which are not seen when small apertures with the same focal length are employed? This superiority is particularly shown with test objects marked with grooves or ridges and obliquely illuminated. The marginal part of the lens will enlarge the grooves and ridges, and they will thus be rendered visible, not because they are seen more distinctly, but because they are expanded by the combination of their incoincident images. Hence we have an explanation of the fact—well known to all who use the microscope,—that objects are seen more distinctly with object-glasses of small angular aperture. In the one case we have, with the same magnifying power, not only an enlarged and indistinct image of objects, but a false representation of them, from which their true structure cannot be discovered; while in the other we have a smaller and distinct image, and a more correct representation of the object. But these are not the only objections to large angular apertures and short focal lengths. 1. In the first place, it is extremely difficult to illuminate objects when so close to the object-glass. 2. There is a great loss of light, from its oblique incidence on the surface of the first lens. 3. The surface of glass,—with the most perfect polish,—must be covered with minute pores, produced by the attrition of the polishing powder; and light, falling upon the sides of these pores with extreme obliquity, must not only suffer diffraction, but be refracted less perfectly than when incident at a less angle. 4. When the object is almost in contact with the anterior lens, the microscope is wholly unfit for researches in which mechanical or chemical operations are required, and also for the examination of objects inclosed in minerals or other transparent bodies. 5. In object-glasses now in use, the rays of light must pass through a great thickness of glass of doubtful homogeneity. It is a question yet to be solved whether or not a substance can be truly transparent, in which the elements are not united in definite proportion; in which the substances combined have very different refractive and dispersive power; and in which the particles are so loosely united that they separate from one another, as in the various kinds of decomposition to which glass is liable. If the best microscopes are affected by these sources of error, every exertion should be made to diminish or remove them. 1. The first step, we conceive, is to abandon large angular apertures, and to use object-glasses of moderate focal length, obtaining at the eye-glass any additional magnifying power that may be required. 2. In order to obtain a better illumination, either by light incident vertically or obliquely, a new form of the microscope would be advantageous. In place of directing the microscope to the object itself, placed as it now is, almost touching the object-glass, let it be directed to an image of the object, formed by the thinnest achromatic lens, of such a focal length that the object may be an inch or more from the lens, and its image equal to, or greater, or less than the object. In this way the observer will be able to illuminate the object, whether opaque or transparent, and may subject it to any experiments be may desire to make upon it. It may thus be studied without a covering of glass, and when its parts are developed by immersion in a fluid. 3. The sources of error arising from the want of perfect polish and perfect homogeneity of the glass of which the lenses are composed, are, to some extent, hypothetical; but there are reasons for believing,—and these reasons corroborated by facts,—that a body whose ingredients are united by fusion, and kept in a state of constraint from which they are striving to get free, cannot possess that homogeneity of structure, or that perfection of polish, which will allow the rays of light to be refracted and transmitted without injurious modification. If glass is to be used for the lenses of microscopes, long and careful annealing should be adopted, and the polishing process should be continued long after it appears perfect to the optician. We believe, however, that the time is not distant when transparent minerals, in which their elements are united in definite proportions, will be substituted for glass. Diamond, topaz, and rock crystal are those which appear best suited for lenses. The white topaz of New Holland is particularly fitted for optical purposes, as its double refractions may be removed by cutting it in plates perpendicular to one of its optical axes. In rock crystal the structure is, generally speaking, less perfect along the axis of double refraction than in any other direction, but this imperfection does not exist in topaz.

"On the motion of glaciers," by the Rev. Canon Moseley.
"On a new induction dip-circle," by Mr. J. A. Broun.
"On an instrument for exhibiting any mixture of the colours of the spectrum," by Prof. Maxwell.
"On curves of the fourth order, having three double points," by Mr. A. Cayley.
"On physics as a branch of the science of motion," by Mr. J. S. S. Glennie.
Report of the committee requested "to report to the meeting at Oxford as to the scientific objects to be sought for by continuing the balloon ascents formerly undertaken to great altitudes," by Prof. Walker.
"On a new general method for establishing the theory of conic sections," by the Rev. Dr. Booth.
"On the influence of small apertures on telescopic vision," by Sir D. Brewster.
"Prospectus of the Hartwell variable star, atlas, with six specimen proofs," by Dr. Lee.
"On some recorded observations of the planet venus in the seventh century before Christ," by the Rev. Dr. Hincks.
"On the principles of meteorology," by Prof. Hennessy.
"On the possibility of studying the earth's internal structure from phenomena observed at its surface," by Prof. Hennessy.
"On the physical constitution of comets," by Professor Pierce.
"On the dynamic condition of saturn's ring," by Professor Pierce.
"A generalisation of Poncelet's theorem for the linear representation of quadratic radicals," by Professor Sylvester.
"On hypsometers, and their comparison with barometers at great heights," by Mr. M. R. Schlagintweit.
"On a new analysing prism," by Professor Jellet.
"On some recent extensions of the theory of exchanges," by Mr. B. Stewart.
"Further researches regarding the laws of chromatic dispersion," by Mr. Mungo Pontes.
"Outline of the principles and practice involved in dealing with the electrical conditions of submarine electric telegraphs," by Mr. M. Werner and Mr. C. W. Siemens.
"On the triplicity of sound," by the Rev. S. Earnshaw.
"On thin films of decomposed glass found near Oxford," by Mr. R. Thomas.
"Notice respecting certain phenomena of crystallisation and polarisation in decomposed glass," by Sir David Brewster.
"On the motion of a pendulum in a vertical plane when the point of suspension moves uniformly on a circumference in the same plane," by Professor Pierce.

The author wrote down the mathematical formulæ which gave the laws which govern such motions. He then exhibited beautifully-executed diagrams on transparent cloth, which showed, by curves, some most regular and some most fantastic in their forms, the behaviour of such a pendulum under various conditions, and at several periods of its course. He pointed out cases in which these curves exhibited all the symmetry and regularity of exact mathematical forms, others, in which these forms were complicated and irregular almost beyond conception. He showed that in some of these cases the state of the pendulum was that of a stable equilibrium, whilst in others the equilibrium was unstable, and the pendulum went off into the most rapid motions. By another series of curves, something like Contour's lines, he showed how the succession of these motions could all be tracked; and he concluded by showing how a similar method was applicable to the tracing of matter through its several varieties of form. Inorganic matter being analogous to the changes and varieties observed in the state of stable equilibrium, while the various states of unstable equilibrium gave many of the surprising and irregular transitions observed in the vegetable and animal kingdoms, or in organized matters.

"On a reflecting telescope for celestial photography, now erecting at Hastings, near New York," communicated by Professor Draper.
"On the results of Bernoulli's theory of gases as applied to their internal friction, their diffusion, and conductivity for their heat," by Professor Maxwell.
"Experiments and conclusions in binocular vision," by Professor W. B. Rogers, Boston.
"Experiments on some of the phenomena of electrical vacuum tubes," by Professor W. B. Rogers, in a letter to M. Gassiot.
"On caustic surfaces," by Professor Lindelöf.
"On some solutions of the problem of tactics by Appollonius of Perga, by means of modern geometry," by Dr. Brennecke.
"On the exhibition of electrical force," by Sir W. Snow Harris.
"On the roots of substitutions," by the Rev. T. P. Kirkman.
"Description of a new reflecting instrument for angular measurement," by Mr. Patrick Adie.
"Description of an instrument for measuring actual distances," by Mr. Patrick Adie.

Professor Stevelly stated that the master of Trinity College, Cambridge, had, at the Southampton meeting of the British Association, explained a method similar in principle to this for observing the heights of the clouds. But from the difficulty experienced in getting a sheet of water for a reflector, both calm and at a sufficient distance below the observer to insure sufficient accuracy, he (Professor Stevelly) had been led to a modification of Dr. Whewell's method, by using mirrors in a way almost exactly the same as that of Mr. Adie; but not nearly so neat in arrangement, nor admitting of such accuracy of observation as his instrument, which he hailed as affording, among many other uses, not only a means of observing the heights of the clouds of different modifications, but also the distance from the observer of those lying off towards the horizon, a fact very difficult under many circumstances, hitherto to determine, or even to estimate correctly.

"On an improved form of air-pump for philosophical experiments," by Mr. W. Ladd.

This pump consisted of an ordinary pump with two barrels to exhaust rapidly at the early stage, then a horizontal barrel, worked by a rack and handle, the piston-rod passing through a stuffing box and cistern of oil, the top of the barrel forming the side of the cistern, and having a valve opening outwards. In the bottom of this barrel was also a valve, opening outwards, to let out any oil which might, in working, pass the piston. The piston of this third barrel, when it passed a hole in the barrel, communicated the vacuum above its piston through a tube connecting it with the receiver. When this barrel worked, a cock shut off the two large barrels from the receiver. The author stated that he could exhaust to the 1-16th of an inch by this pump. Mr. Yeates, of Dublin, explained a simple pump nearly similar in construction to that now shown by Mr. Ladd, which he had excuted several years ago.

"On rings seen in fibrous specimens of calcspar," by Mr. Storey.
"On the effect of a rapid current of air," by Mr. R. Dowden.
"On an atmotic ship," by the Hon. Mr. W. Bland, N. S. Wales.

The proposal in this case was by a light keel and ship-formed body buoyed up by an elongated balloon, by two heavy weights guided by a rope slung from stem to stern, so to alter the centre of gravity of the machine as to direct its motion upwards or downwards at pleasure, and to cause it to move onwards in any assigned direction by the aid of large but light and strong vanes driven round and acting like the screw propeller of a ship.

"On a general law of motion applied to the planets," by Mr. F. S. Glennie.
"On a new proof of Pascal's theorem," by the Rev. T. Rennison.
"On the chromoscope," by Mr. J. S. Perth.

The author sent a specimen of the cut-out card by the rotaton of which over a black ground in strong light, as sunlight, he could produce rings of various colours. There were also diagrams exhibited, painted so as to represent the several colours and tints of which the author had succeeded in causing the rings to appear.

"On the brilliant eruption on the sun's surface, on the 1st of September, 1859," by Mr. R. Hodgson.
"On the climate of the Antartic regions, as indicated by observations upon the height of the barometer and direction of the winds at sea;" also a letter "on Antarctic expeditions," by Captain Maury, U. S. Navy.
"On the dispersion of planes of polarisation produced by magnetism," by M. Verdet.
"On the diurnal variations of the magnetic declination at the magnetic equator, and the decennial period," by Mr. J. A. Broun.
"On certain results of observations in the observatory of the Rajah of Travancore," by Mr. J. A. Broun.
"On the similarity of the lunar curves of minimum temperature in 1859 at Utrecht and Greenwich," by J. P. Harrison.
"Results of ten years' meteorological observations at Stoneyhurst," by the Rev. A. Weld.
"Results of an investigation into English thunderstorms during 1857-8-9," by Mr. G. F. Symons.
"Regulateur Automatique de Lumière Electrique," by M. Serrin.

To form the electric arch of light, it is first necessary to bring the charcoal points into contact, then gently to separate them by degrees, as they glow afterwards, to cause them to approach constantly, as they are wasted by use, carefully avoiding bringing them into contact. In order to keep the point of illumination fixed in space, each charcoal point must simultaneously approach the other, and that in the proportion in which each is wasted by use. In fine, for rendering the electric light useful, all these conditions must be self-produced with the utmost regularity, without any intervention of the human hand—that is to say, in a manner completely automatic; and this was the object this regulator was invented for. In a simple and easy manner this apparatus, which may be compared to an extremely sensible balance, is composed of two mechanisms connected the one with the other, and yet independent; when one acts the other is in repose, and reciprocally. One of these consists of an oscillating system,—the chief feature of the regulator destined to produce the separation of the charcoal points, and also to determine their re-approach. The other mechanism, composed of wheel-work, has for its object to insure the re-approach of the charcoal points in the proportion of their waste by use. The two port-carbons which carry the charcoal pieces are placed vertically one above the other. The superior is in connection with the wheel-work, and is the positive electrode of the battery; the inferior depends as well on the wheel-work as on the oscillating system, and is the negative electrode. The superior port-carbon, by its weight, causes the inferior to ascend. The oscillating system forms a parallelogram, of which the angles are jointed, one of the vertical sides of which is suspended by a spring, and carries at its lower part a soft iron armature, placed over a horizontal electro-magnet. When the apparatus is in repose, the charcoals are in contact; on the contrary, they separate when they complete the circuit and the voltaic arc appears. As the wasting by use of the charcoals increases the length of the voltaic arc, and the armature increases its distance from the electro magnet, it becomes less powerful, and the charcoals re-approach by a quantity frequently less than the one hundredth of a millimètre; but according as they re-approach the electro-magnet recovers its original power, the armature is attracted anew, and the charcoals stop until a new wasting gives rise to a new re-approach, followed by another stoppage, and so on in succession. In consequence of its extreme sensibility, it will work either with a voltaic pile or an electro-magnetic machine.

"Pile à sulfate de plomb de M. Edmond Becquerel," by M. Serrin.
"Posphorescence de M. Becquerel," by M. Serrin.
"On practical experience of the law of storms in each quarter of the globe," by Captain P. Snow.
"Notes on atmospheric electricity," by Professor W. Thomson.

Section B.—Chemical Science.

Mr. Symons exhibited some forms of alkali-meters suggested by Mr. Weirs.
"On some remarkable relations existing between the atomic weights, atomic volumes, and properties of the chemical elements," by Mr. J. J. Coleman.
"On the deodorisation of sewage," by Dr. Bird.
"On a new organic compound containing boron," by Dr. Frankland and Mr. Duppa.
"On the analysis of some Connemora minerals," by Prof. Rowney.
"On the transmission of electrolysis across glass," by Mr. W. R. Grove.

If glass, or an equally non-conducting substance, be interposed between electrodes in an electrolyte, so that there be no liquid communication around the edges, it is hardly necessary to say that, according to received opinions and experiments, no current passes, and no electrolysis takes place. Mr. Grove was led by some theoretic considerations to think that this rule might not be without an exception, and the following experiment realized his view:—A Florence flask well cleaned and dried was filled two-thirds full of distilled water, with a few drops of sulphuric acid added to it, and placed in an outer vessel, containing similar acidulated water, and which reached to the same height as the liquid in the interior. A platinum wire was passed through a glass tube, one end of which was hermetically sealed to the platinum, so that a small part of the wire projected beyond the tube. This tube passed through a cork fitted to the flask, and the platinum point dipped into the liquid within the flask, and a similar coated wire was dipped into the outer liquid, and the two wires connected with the extremities of the secondary coil of a Ruhmkorff's apparatus. Upon the latter being excited by the battery a stream of minute bubbles arose from both the platinum points, proving that electrolysis took place notwithstanding the interposition of the glass. The portions of the flask above the liquid both outside and inside were perfectly dry, so that there could have been no communication of the current over the surface of the glass. This was further proved by removing the outer wire a short distance from the liquid, when sparks passed nearly equal in length to those between wires from the terminals. As the outer wire was further removed, keeping it near the flask, sparks passed along the surface of the latter for a short distance; and as it was further removed from the liquid, still being near the flask, they ceased, thus showing that there was no passage of electricity over the upper and unwetted surface of the glass. With unacidulated water no electrolysis was observed, nor when a battery of thirty cells was used instead of Ruhmkorff's coil. In the first experiment the evolution of gas gradually diminished, and ceased in about twenty minutes, but recommenced on reversing the current. Mr. Grove concluded that the electrolysis was effected by induction across the thin glass of the Florence flask, and that its cessation indicated something like a state of charge or polarisation of the surface of the glass.

"On the composition of jet," by Prof. Rowney.
"On a new form of blowpipe, for laboratory use," by Dr. Hermann Sprengel.
"On the occurrence of poisonous metals in cheese," by Prof. Voelcker.
"On waterproof and unalterable small-arm cartridges," by Mr. T. Scoffern.
"On the isomers of cumole," by Mr. W. De la Rue and Dr. Hugo Muller.
"On a new acetic ether occurring in a natural resin," by Mr. W. De la Rue and Dr. Hugo Muller.
"On the atomic weight of oxygen," by Dr. W. A. Miller.
"On the representation of neutral salts, on the type of a neutral peroxide HO_2 instead of a basic oxide H_2O_2," by Dr. L. Playfair.
"On some reactions of zinc-ethyl," by Mr. Buckton.
"Remarks on the volume theory," by Dr. Von Bose.
"On ozone," by Dr. Andrews.
"On the quantitative estimation of peroxide of hydrogen," by Professor Brodie.
"On the oxidation of potassium and sodium," by Mr. A. V. Harcourt.
"Note on the destruction of the bitter principle of cbyraitta by the agency of caustic alkali," by Mr. J. J. Coleman.
"On the composition of the ash of wheat grown under various circumstances," by Mr. J. B. Lawes and Dr. J. H. Gilbert.
"On thiotherine, a sulphuretted product of decomposition of albuminous substances," by Dr. Thudichum.
"On the causes of fire in Turkey-red stoves," by Dr. W. Wallace.

Section C.—Geology.

"On the geology of the vicinity of Oxford," by Prof. Philips.
"On the invertebrate fauna of the lower oolites of Oxfordshire," by Mr. J. F. Whiteaves.
"On the Blenheim iron ore, and the thickness of the formations below the great oolite at Stonesfield," by Mr. E. Hull.
"On the stratigraphical position of certain species of coral in the lias," by the Rev. P. B. Brodie.
"On the geological characters of the Sahara," by the Rev. H. B. Tristram.
"On the mode of flight of the pterodactyles of the coprolite bed near Cambridge," by the Rev. J. B. P. Dennis.
"Remarks on the elevation theory of volcanoes," by Dr. Daubeny.
"Notes on some points in chemical geology," by Mr. T. Sterry Hunt.
"On the geographical and chronological distribution of Devonian fossils in Devon and Cornwall," by Mr. W. Pengelly.
"On the *avicula contorta* bed, and lower lias in the south of England," by Dr. Wright.
"On some new facts in relation to the section of the cliff at Mundsley, Norfolk," by Mr. Joseph Prestwich.
Sir I. Murchison exhibited the new geological map of Oxford.
"On snow crystals observed at Dresden," by Dr. Geinitz.
"On the silurian formation in the district of Wilsdruff," by Dr. Geinitz.
"On the metamorphic rocks of the north of Ireland," by Prof. Harkness.
"On the intermittent springs of the chalk and oolite of the neighbourhood of Scarborough," by Capt. Woodall.
"Report on the Dura Den excavations," by Dr. Anderson.
"On circular chains in the Alps," by M. A. Favre.
"On the contents of three square yards of triassic drift," by Mr. C. Moore.

The author stated that several years ago he suspected the presence of triassic rocks in the neighbourhood of Frome, from accidentally finding a single block of stone on a roadside heap of carboniferous limestone, containing fish remains of the former age, but that for a long time he was unable to discover it *in situ*. More recently, when examining some carboniferous limestone quarries near the above town, he observed certain fissures which had subsequently been filled up by a drift of the later age. One of these was about a foot in breadth at the top, but increased to 15 feet in breadth at the base of the quarry, thirty feet below, at which point teeth and bones of triassic reptiles and fishes were found. Usually these infillings consisted of a material as dense as the limestone itself, and from which any organic remains could only be extracted with difficulty. In another part of the section he was fortunate enough to find a deposit consisting of a coarse friable sand, containing similar remains. In order that this might receive a more careful examination than could be given to it on the spot, the whole of it, consisting of about three tons weight, was carted away to the residence of the author, at Bath, a distance of twenty miles, all of which had passed under his observation, with the following results:—The fish remains, which were the most abundant, were first noticed. Some idea might be formed of their numbers when he stated that of the genus acrodus alone, including two species, he had extracted 45,000 teeth from the three square yards of earth under notice, and that they were even more numerous than these numbers indicated, since he rejected all but the most perfect examples. Teeth of the sauricthys of several species were also abundant; and, next to them, teeth of the hybodus, with occasional spines of the latter genus. Scales of gyrolepis and lepidotus were also numerous, and teeth showing the presence of several other genera of fishes. With the above were found a number of curious bodies, each of which was surmounted by a depressed, enamelled, thorn-like spine or tooth, in some cases with points as sharp as that of a coarse needle; these the author supposed to be spinous scales, belonging to several new species of fish, allied to the squaloraia, and that to the same genus were to be referred a number of hair-like spines, with flattened, fluted sides, found in the same deposit. There were also present specimens, hitherto supposed to be teeth, and for which Agassiz had created the genus ctenoptychius, but which he was rather disposed to consider—like those previously referred to—to be the outer scales of a fish allied to the squaloraia. It was remarked that, as the drift must have been transported from some distance, delicate organism could scarcely have been expected; but, nothwithstanding, it contained some most minute fish-jaws and palates, of which the author had, either perfect or otherwise, 130 examples. These were from a quarter to the eighth of an inch in length, and within this small compass he possessed specimens with from thirty to forty teeth; and in one palate he had succeeded in reckoning as many as seventy-four teeth in position, and there were spaces where sixteen more had disappeared, so that, in this tiny specimen, there were ninety teeth! Of the order reptilia there were probably eight or nine genera, consisting of detached teeth, scutes, vertebræ, and ribs, and articulated bones. Amongst these he had found the flat crushing teeth of the placodus: a discovery of interest, for hitherto his reptile had only been found in the muschelkalk of Germany,—a zone of rocks hitherto wanting in this country, but which, in its fauna, was represented by the above reptile. The most important remains in the deposit were indications of the existence of triassic mammalia. Two little teeth of the microlestes had, some years before, been found in Germany, and were the only traces of this high order in beds older than the Stonesfield slate. The author's minute researches had brought to light fifteen molar teeth, either identical with, or allied to, the microlestes, and also five incisor teeth, evidently belonging to more than one species. A very small double-fanged tooth, not unlike the oolitic spalacotherium, proved the presence of another genus and a fragment of a tooth, consisting of a single fang, with a small portion of the crown attached, a third genus, larger in size than the microlestes. Three vertebræ, belonging to an animal smaller than any existing mammal, had also been found. The author inferred that, if twenty-five teeth and vertebræ, belonging to three or four genera of mammalia, were to be found within the space occupied by three square yards of earth, that portion of the globe which was then dry land, and from whence the material was in part derived, was probably inhabited at this early period of its history by many genera of mammalia, and would serve to encourage a hope that this family might yet be found in beds of even a more remote age.

"On the osseous caves of Tenby," by the Rev. G. N. Smith.
"On the igneous rocks interstratified with the carboniferous limestone of the basin of Limerick," by Prof. Jukes.
"On the stratigraphical position of certain species of corals in the Lias," by the Rev. P. B. Brodie.
"On some reptilian foot-prints from the new red sandstone North of Wolverhampton," by the Rev. W. Lister.

"On the effects of long-continued heat—shown in the iron furnaces of the West of Yorkshire," by the Rev. W. V. Harcourt.

"On some phenomena of metamorphism in coal in the United States," by Prof. Rogers.

"On the geology of the vicinity of the neighbourhood of Cambridge, and the fossils of the upper green sand," by Prof. Sedgwick.

"Some observations upon the geological features of the volcanic island of St. Paul, in the South Indian Ocean, illustrated by a model in relief of the Island, made by Capt. Cybulz, of the Austrian artillery, by Prof. F. von Hochstetter.

"Remarks on the geology of New Zealand, illustrated by geological maps, drawings, and photographs," by Prof. F. von Hochstetter.

"On some transformations of iron pyrites, in connection with fossil remains," by Mr. A. Gages.

"Remarks on fossil fish from the North Staffordshire coal-fields," by Mr. W. Molyneux.

"On the old red sandstone and its fossil fish in Forfarshire, with an account of the fish by Sir P. Egerton," communicated by Sir R. I. Murchison, by Mr. W. Powrie.

"On a new form of ichthyolite discovered by Mr. Peach," by Sir P. Egerton.

"On two newly-discovered caves in Sicily containing worked flints," by Baron F. Anca.

"On the six-inch maps of the geological survey," by E. Hull.

"On the selection of a peculiar geological habitat by some of the rarer British Plants," by the Rev. W. Symonds.

"On the Koh-i-Noor previous to its cutting," by the Rev. W. Mitchell and Prof. Tennant.

"On a recent volcanic eruption in Iceland," by Dr. W. S. Lindsay.

"Details respecting a nail found in Kingoodie Quarry," by Sir D. Brewster.

"On the Tynedale coalfield and whinsil," by Mr. J. A. Knipe.

"On silkensides," by Mr J. Price.

"Notes on the geology of Capt. Palliser's route across the Rocky Mountains," by Dr. Hector.

MONTHLY NOTES.

MARINE MEMORANDA.

On the 21st ult., was launched from the South Dock outlet at Sunderland a steam-tug, the *Vigilant*. She measures in length of keel, 80 feet; breadth, 18 feet; depth, 9 feet; copper-fastened; and is the property of Messrs. George Craggie and Co., of Sunderland.

Messrs. Scott and Co., of Greenock, recently launched a fine paddle steamer for the trade on the north coast of Brazil, named *Guajara*, and measusing 400 tons register. Her engines, of 110 horse power, on Rowan's patent, will be supplied by the Greenock Foundry Company.

The first vessel built at Workington for war purposes was launched on the 18th ult., from the yard of Mr. C. Lamport. About forty members of the 7th Cumberland Rifle Corps, of which Mr. Lamport is captain, attended in uniform, headed by Lieut. Falcon, and fired a salute as the gunboat, named the *Speedy* by Mrs. Falcon, glided from the ways. The *Speedy* is calculated to mount two 32 and 68 pounders, and her burthen is 268 tons, length 120 feet, breadth 22 feet, and depth 9½ feet. She has been built under particular inspection, and her fastenings are altogether of copper.

On the 19th ult., a handsomely modelled steam screw sloop of war, named the *Pelican*, was launched at Pembroke. The ceremony took place at 6·35 p.m., and was most successful. The following is a statement of her principal dimensions:—Length between perpendiculars, 185 feet; length of keel for tonnage, 164 feet ½ inch; breadth extreme, 33 feet 2 inches; breadth for tonnage, 33 feet; breadth, moulded, 32 feet 4 inches; depth in hold, 17 feet 5 inches; horse-power, 200; burthen in tons, 950 8·94. She was taken in charge by Mr. Paul, assistant master attendant, who arrived with a company of seamen in the *Avon* steam tender the day before, and when jury-rigged will be navigated by him to Portsmouth, where she will be fitted for sea.

Messrs. Pile, Spence, and Co., of Hartlepool, launched on the 18th ult., a magnificient screw steamer, named the *Rangoon*. This vessel has been purchased by Messrs. William M'Kinnon and Co., of Glasgow, for the Calcutta and Burmah Steam Navigation Company. Her dimensions are:—Length over all, 215 feet; extreme breadth, 27 feet; depth, 15½ feet; admeasures 750 tons O.M., and classed twelve years A 1 at Lloyd's. Has a full poop and topgallant forecastle, and is altogether a fine specimen of naval architecture. All her decks, cabins, roundhouses, and the rest of her woodwork, are composed of East India teak. She will be brig rigged, with engines of 120 horse-power, by Messrs. T. Richardson and Son, Hartlepool Iron Works, and furnished with lifting apparatus to ship and unship the screw. She will be equipped with all possible speed, and sent out direct to Calcutta. This is the fourth vessel launched from this establishment during the present year, averaging 750 tons O.M. each. In the present month will be launched from the same establishment a large sailing ship of 1,300 tons, the property of an eminent Liverpool firm, with whom Messrs. Pile, Spence, and Co. have contracted for another vessel of the same size to follow.

Messrs. Richardson, Duck, and Co., have launched from their yard at Middlesborough, a steel screw steamer, the dimensions of which are as follows: Length over all, 93 ft.; extreme breadth, 19 ft. 6 in.; depth of hold, 8 ft. 2 in.; engines, 60 horse-power. This vessel is built entirely of puddled steel, so as to combine the two essential qualities of lightness and strength, the thickest part of the outside plating being only 3-16ths of an inch. She is intended to trade out of the river Severn, and is enabled by her build to run as far up the river as Stourport, to which place she belongs. She will be chiefly employed in bringing China clay from Poole, and, to adapt her for both sea and river service, she is fitted with a sliding keel to increase her sailing capacities at sea, but which can be entirely drawn up when in the river or anywhere requiring light draughts of water. She is built, we believe, as an experimental vessel, and should she succeed it is probable several others will be built for the same trade. It will be remembered that the great river troop steamer which was built at Stockton a few months ago was also made of steel plate. The thinness of the steel plate compensates, in strength and cost, for the thick iron plates used in boat building.

The launching of the fine line-of-battle screw steamship *Atlas*, 91 guns, took place recently at Chatham, with the most complete success, making the fourth large vessel of war which has been launched from that dockyard in little more that twelve months. The *Atlas* is one of the finest vessels ever constructed at this dockyard, and is as noble a specimen of naval architecture as any ship in H.M.'s navy. She has been a little more than two years in progress, having been commenced in February, 1858, and was laid down from the designs and drawings of Admiral Sir Baldwin W. Walker, K.C.B., Comptroller of the Navy, She has been completed under the superintendence of Mr. O. W. Lang, the master shipbuilder of this dockyard. The following are her dimensions:—Length between perpendiculars, 244 ft. 9 in.; length of keel for tonnage, 210 ft. 9 in.; breadth, extreme, 55 ft. 4 in.; breadth, moulded, 53 ft. 8 in.; breadth for tonnage, 54 ft. 6 in.; depth in hold, 24 ft. 6 in.; burthen, in tons, 3,317 78·94. She is to be fitted with engines of 800 horse-power by Maudslay, Son, and Field. Her armament will be arranged as follows:—Lower deck—34 8-inch guns, each 65 cwt., and 9 ft. long; main deck—34 32-pounders, each 58 cwt., and 9 ft. 6 in. long; upper deck—22 32-pounders, each 45 cwt., and 8 ft. 6 in. long; and one pivot 68-pounder, 10 ft. long. Mrs. Schomberg, the wife of Captain C. F. Schomberg, commanding the steam reserve at this port, performed the ceremony of naming, and everything went of satisfactorily. Another large vessel, to be built on the same lines as the *Atlas*, will be at once laid down on the same slip.

The total number of steam vessels registered in the United Kingdom on or before the 1st of January last, was 1,863, with a gross tonnage of 666,513, and, exclusive of engine room, 429,474 tonnage.

As regards Scottish ports, it appears that 1,530 vessels entered inwards last year at Leith, with a tonnage of 216,356 tons; and 415 vessels cleared outwards, with a tonnage of 98,877 tons, the declared value of the exports being £872,673. The entrances inwards at Glasgow comprised 697 vessels, with an aggregate tonnage of 144,066 tons; and the clearances outwards, 974 vessels, with an aggregate tonnage of 256,095 tons, the declared value of the exports being £5,394,376. The entrances inwards at Greenock included 312 vessels, with a tonnage of 120,527 tons; and 203 vessels cleared outwards, of an aggregate tonnage of 95,713 tons, the declared value of the exports being £1,106,268. The accounts of the Greenland seal and whale fishery, just received at Peterhead, state that the results obtained had been below the average, and that there was little prospect of improvement. The herring fishery on the north-east coast has been prosecuted with encouraging success.

The wrecks on our coast last year were more numerous than they have been in any former year of which record is kept. The excess was caused by two violent gales. In the gale of the 25th and 26th of October, there were 133 total wrecks and 90 casualties. The number of lives lost in that one gale on our shores was within two of eight hundred. The loss of life would have been great, had the dead list not been more than doubled by the loss of 446 lives in the *Royal Charter*. After a rest of five days, the winds blew again on the first day of November; and in that gale, 29 lives were lost in the wreck of 38 vessels. There were also two great wrecks on other days to swell the death list. In the beginning of spring more than 400 lives were lost at once in the *Pomona*. Fifty-six were lost in midwinter with the *Blervie Castle*. These were all deaths on our shore. Of wrecks at sea nothing is said. It has been found that the proportion of accidents has become much greater than it used to be in British, as compared with foreign vessels. Putting out of account the coasting trade and reckoning the oversea trade only, the chance of accident to a British ship is once in 175 voyages; but that to a foreign ship the average of accident is only once in 335 voyages; accidents upon our coasts, therefore—strange fact!—are twice as likely to occur to a vessel that is at home as to the vessel of a stranger. One accident occured to a vessel aged more than a century, one to a ship between eighty and ninety, and another to a ship between ninety and a hundred years of age. Sixty-four wrecks were of ships more than fifty years old; but it is between the ages of fourteen and twenty that ships have appeared to suffer most. The age next in liability to misfortune was between twenty and thirty; then the comparatively new ships, between three and seven, suffered most. Of the wrecks last year, more than six hundred were on the east coast, less than five hundred on the west coast, and less than one hundred and fifty on the south coast. On the Irish coast there were but ninety-nine wrecks, against one hundred and sixty-eight in the preceding year, but wrecks on the Isle of Man increased in number from six to twenty-eight. The value of the property lost by the wrecks on our coast last year was two millions of money, the lives lost were, as before said, one thousand six hundred and forty-five; but, as there were more wrecks, more losses than ever, so were there more lives saved from wrecks than ever About three hundred were saved by life boats, nearly as many by the rocket and mortar apparatus, a thousand by luggers, coast guard or fishermen's boats, and small craft, nearly eight hundred by ships and steam vessels, and six by the heroism of individuals. Last year, as in the previous year, it was the south-west wind that proved most disastrous. Of the two most fatal gales, Admiral Fitzroy has pointed out that they were foretold by both thermometer and barometer, and that their advance could have been telegraphed from the southern to the eastern and northern coasts in sufficient time to ensure full preparation. "It is proved," writes the admiral, "that storms are preceded by distinct warnings, and that they advance in particular directions towards places where their influence is felt some time after it has become marked elsewhere. Therefore, information may be conveyed by telegraph in time to caution those at a distance who are likely to be visited by bad weather. Of the message swifter than the wind, no use has yet been made for the protection of our sailors. Warning was again neglected of the yet more terrible gales of this year. In the lost Yarmouth fishing boats alone, 130 men perished, 200 in the boats from Yarmouth and the adjacent dozen miles of coast."

Life Boats.—The Royal National Lifeboat Institution has lately forwarded two of its best single-banked lifeboats, accompanied with their transporting carriages, to the Isle of Wight. They are to be stationed respectively at Brook and Grange, on the south-west coast of the island. Each boat is 30 ft. long, 7 ft. wide, and rows eight oars. A short time ago a harbour trial of them took place at Limehouse, in the presence of their builders, Messrs. Forrest, the inspector of lifeboats to the institution, and many other gentlemen. Their self-righting qualities were fully and satisfactorily developed. The water thus shipped was self-ejected through patent valves in about 20 seconds. The following are among the most remarkable qualities of this class of lifeboat:—1. Great lateral stability. 2. Speed against a heavy sea. 3. Facility for launching and for taking the shore. 4. Immediate self-discharge of any water breaking on board. 5. The important advantage of self-righting if upset. 6. Strength. 7. Stowage room for a number of passengers. The transporting carriages of the boats, which have been built by Mr. Robinson, of Camden-town London, are admirably adapted for their purpose. By an ingenious contrivance the boat is launched off the carriage, with her crew on board with their oars in their hands, and they are thus enabled to obtain headway on the boat before the breakers have time to beat her broadside on to the beach. The hauling up of the boat on to her carriage is accomplished with equal facility. The cost of the Grange lifeboat and carriage is the gift of the Royal Victoria Yacht Club. Commodious and substantial houses have been built for the reception of the boats and their stores. The carriages are from designs specially prepared by Mr. C. N. Cooke, architect to the institution. There will probably not be a more complete lifeboat establishment on the English coast than will now be found on the south coast of the Isle of Wight. There are adjacent parts of the coast which as urgently require to be furnished with these means of saving human life as did Brook and Grange. Almost within sight Selsea Bill stands out with its reefs of rocks for miles in advance into the English Channel. Scarcely a gale sweeps along our coasts but some ill-fated vessel drives on to those rocks or the adjoining shore in Bracklesham Bay. This latter spot has during the past two years been the scene of many sad disasters, and numerous lives have been lost for want of a boat that could be put off through the surf, none of the boats, coastguard or others, being of use with the wind on the shore. The recent wreck of the French bark, *Diane*, in the bay, resulted in the death of the master and three of his crew for want of some means of reaching the shore. The coast from the mouth of Chichester harbour to the "Park," to the eastward of Selsea Bill, is but thinly populated, and the greater part of the people look upon a wrecked vessel as a godsend. In the *Diane's* case, on the morning succeeding the wreck, 24 large cases, containing the most valuable portion of her cargo, lay upon the beach, emptied of their contents. With a good lifeboat available, these men would find more congenial occupation in the excitement of saving their fellow-creatures' lives than in plundering the cargo of the wrecked ship. The National Lifeboat Institution has now 103 lifeboats in connection with it, a truly noble fleet, out-numbered by those of commerce and war, but the largest life-saving fleet the world has yet seen. Some of these boats have even during the present year been instrumental in saving 115 of our fellow-creatures from a watery grave.

Electro-Telegraphy.—A company is now being attempted to be formed which proposes to adopt Mr. Allan's new contrivances, and to forward short messages to any part of the United Kingdom at the uniform rate of one shilling, a plan which will certainly be highly acceptable to the general public. In Switzerland, short messages have been forwarded for a franc for some time past. In America, also, the charges are very low. There can be no doubt that when the cost is lowered the recourse to the electric telegraph will be greatly increased, and the utility of the wonderful instrument will become vastly more apparent.

Export of Coal from England and Scotland.—The following is given as the total export of coal from the ports of England and Scotland during the month of June:—Northern ports: Newcastle, Shields, &c., 374,890. Yorkshire ports: Hull, Grimsby, and Goole, 22,722; Liverpool, 76,257. Severn ports: Bristol, Cardiff, &c., 128,160. Scotch ports: Glasgow, Greenock, &c., 43,834—being an increase over June last of 45,858 tons. With reference to the exports from Grimsby, a correspondent calls attention to the following facts:—"The quantity now shipped from the ports of Grimsby and Goole forms a large item in the annual exports. The total amount shipped from Grimsby alone during last year was 130,828 tons, and although there has been a little decrease (as at other ports) during the first six months of the present year, the amount has reached 55,266 tons up to June 30, leaving the best portion of the year for exports yet to come. Had it not been for the very unsettled condition of the South Yorkshire pitmen, the exports would have been greater from the ports of the Humber during the present year than they have been."

The Decimal System.—At the fifth general meeting of the international decimal association, considerable progress was reported as having been made in Russia, Italy, Norway, Portugal, and other countries, in the introduction of the metrical system. Vice-presidents for various continental states and British colonies were appointed. The resolutions with respect to weights, measures, and monies, adopted by the 6th section of the international statistical congress, were brought before the meeting, and approved, the association resolving to give all the aid in its power to the method of inquiry suggested by the congress. Mr. Thomas Mitchell, the under secretary of the British branch of the association, having been appointed attaché to Her Majesty's Legation at St. Petersburg, was requested to represent the association, and forward its objects in the empire of Russia. A resolution was also passed calling on every branch of the society to assist in urging on the different governments of Europe, the necessity of an international system of weights and measures.

French Consumption of Coal.—France consumes at the present period about 11,000,000 tons of coal annually, or about the same quantity as England annually exports to foreign markets generally. This consumption is distributed as follows:—For general manufacturing purposes, 3-5ths; domestic use, 1-5th; railways and steam marine, 1-15th; mines and quarries, 1-25th. Of this more than one-half is supplied by importation, the importing countries being England, Belgium, and Prussia. The quantities sent from each of these countries in 1858 were as follows:—England, 1,137,456 tons; Belgium, 2,680,238 tons; Prussia, 726,025 tons. In 1850 England sent 500,000 tons; Belgium, 1,700,000 tons; Prussia, 20,000 tons. Thus, in eight years, the increase of importations into France from England has been 120 per cent.; from Belgium, 50 per cent.; and from Prussia, 250 per cent.

Curious Mode of Whale Fishing.—The result of some experiments in killing whales by means of poison, carried out by Messrs. W. and C. Young, of Leith, has lately been published by Professor Christison. About two ounces of prussic acid were enclosed in a glass tube. To each side of a harpoon near the blade, one end of a strong copper wire was firmly attached, the other end of which passed obliquely over the tube, thereby securing it in its place, then through an oblique hole in the shaft, close to the upper end of the tube, and finally, to a bight in the rope, where it was firmly secured. By these means the rope could not be drawn tight, as it would when the harpoon attached to it struck the whale without crushing the tubes; the poison would then enter the whale, and death ensue. The Messrs. Young sent a quantity of tubes charged with the poison by one of their ships engaged in the the Greenland fishery, and on meeting with a fine whale, the harpoon was skilfully and deeply buried in its body; the leviathan immediately dived perpendicularly downwards, but in a very short time the rope relaxed, and the whale rose to the surface, quite dead. The men were so appalled by the terrific effect of the poisoned harpoon, that they declined to use any more of them. Subsequent experiments, however, showed that this mode of capturing whales might be carried out with perfect success.

Telegraphic Lamps.—The first complete set of lamps forming the numerical code of signals, invented by Mr. W. H. Ward, of Auburn, United States, and termed the "Ocean Telegraph" (one of which was tried six months ago), having been made according to Admiralty instructions for experiments on board the Channel fleet, have been received at Woolwich, and tested at the masthead of the flag-ship *Fisgard*, under the inspection of Commander Hawker, Mr. Thomas, Mr. Petley, and other officers of the yard, who directed the transmission of a course of signals, which were replied to from different points on shore. It was stated that the lights reflected as signals by this new and ingenious method were distinctly read at the distance of two miles. The improvement now effected in operating with the various red, white, and dark shades, from the deck of the ship, appeared to satisfy the committee as to the facility with which messages may be despatched from ship to ship and shore, as well as the brilliancy of the lights; and they stated that the invention was perfect, with one exception—namely, the weight of the lamps, each of which exceeded 30 lb., and it was their desire that this slight drawback should, if possible, be remedied. Further experiments are ordered to take place on a future occasion.

Steam Traction Engines for Common Roads in Brazil.—The steam traction engine for common roads, on Boydell's principle—made some time ago by Messrs. E. T. Bellhouse & Co., of the Eagle Foundry, Manchester, for Brazil—has recently had a successful practical trial of its capabilities. The engine has ascended from the end of the Maria Railway to the city of Petropolis, a length of eight miles, rising on the whole to a height of 3000 feet above the sea. The road consists of a series of zigzag turns winding on the mountain sides of the Sŏerra, and many of the inclines are very steep. The engine was attended by Robert Milligan, Esq., C.E., the managing engineer of the Mana Railway, and its appearance at the city of Petropolis was hailed with much surprise by the inhabitants, who at first could hardly be persuaded that the engine and train had ascended by the sole agency of steam power. These engines are likely to be of much use in Brazil, as the cost of transport by animal power is exceedingly great. The introduction of this system of traction in the Brazils is owing to the enterprise of the Baron de Maria, a Brazilian, who is largely imbued with European ideas, and to whom the empire is indebted for most of the important steps of progress which have been recently made in the Brazils.

Our New Fortifications.—What with volunteer rifle and artillery corps, and new war vessels, and the discussions consequent upon all such preparatory measures, we have been kept fully alive to the fact that the nations are arming with a vengeance. Now we have something further of deeper interest for the engineer, and that is, the construction of enormous fortifications—a purely stationary means of defence. The proposed works are divided into eight districts. Portsmouth: The total estimated cost, including purchase of land, is—Spithead, £840,000; Needles, £150,000; Isle of Wight, £130,000; Portsdown, £650,000; Gosport "Advance," £150,000—total, £1,920,000. Plymouth: Sea defences, £375,000; Staddon Heights, £200,000; Maker Heights, £25,000; North East defences, £600,000—total, £1,200,000. Pembroke: Bays to southward, £100,000; Work at Scoveston, £120,000—total, 220,000. Thames: Four batteries, £180,000. Medway and Sheerness: Sea Defences and Works in front of Mile Town, £350,000. Chatham: Eastern Defences, £650,000. Dover: Work in front of Castle, and other improvements. £170,000. Cork: Defences proposed by Commissioners, £120,000. Central Arsenal: For purchase of a site, £150,000. Total estimated cost, £4,960,000. For Works already sanctioned by Parliament, the cost is—Portsmouth, £150,000; Plymouth, £75,000; Pembroke, 55,000; Portland, £30,000; Dover, £40,000—total, £350,000. Grand total required, irrespective of sum provided in estimates 1860–61, £2,000,000. There is work enough for engineers who understand the subject, and builders too.

Steam Carriages for Common Roads.—The common road locomotive,* to which we referred last month as being built for the Earl of Caithness, has now had a fair practical trial in the North of Scotland. Lord Caithness took his engine down by sea and started with it from Inverness, and although, owing to its being the market day there, the road was filled with horses and conveyances of all kinds, he passed through them all without any more inconvenience to the general traffic or alarm to horses, than if he had been in his carriage-and-four. So perfectly had he the whole moving power under his control, that he stopped more quickly than an ordinary carriage and horses could draw up, and this he did as often as he saw the least danger of any horse being frightened. He reached Beauly, a distance of fourteen miles, in an hour and twenty minutes, notwithstanding the frequent stoppages, and fifteen minutes lost in getting water. After leaving Beauly, on those parts of the road where some distance forward can be seen, he attained the speed of eighteen miles an hour, and could have kept this up for any distance with ease and safety. After reaching Allness his lordship took the road direct for Bonar bridge. Here the carriage had a severe test applied to it, but he drove it up the hills without difficulty, and coming down the very steep declivity near where the road joins the road from Tain, the control over it was most satisfactory, and enabled the driver to descend at any rate he wished, and with perfect ease and safety. Leaving the hospitable inn at Ardgy, Lord Caithness crossed Bonar bridge, and drove on to Clashmore, after a successful drive of nearly seventy miles. Saturday being very wet he remained there till the afternoon, and then drove on to Golspie to remain over Sunday, and having perfect confidence in his carriage from its working on Friday, he expects to reach Barrogill Castle, a distance of eighty miles, and over the steepest roads in Scotland. His lordship has made this somewhat bold step of applying steam as a propelling power to carriages on common roads for any long distance, and the result of the first day has more than answered the expectations of its warmest promoters, and left no doubt as to its being not only practicable, but useful, when so applied. In our report of the British Association, we give an interesting paper on this subject, which was read by his lordship in the presence of the mechanical section.

Cisterns in Venice.—At a recent meeting of the academy of sciences in Paris, M. G. Grimand, gave some practical information on the manner in which the Venetians construct their cisterns, and which he thinks might be advantageously introduced on the heights which overlook Paris, and are occupied by large establishments and a numerous population, which would greatly benefit by them. Venice occupies a surface of 1,300 acres, exclusive of all the great and small canals which intersect it. The annual average of rain is 34 inches, the greater part of which is collected in 2,077 cisterns, 177 of which are public. The rain is sufficiently abundant to fill the cisterns five times in the course of the year, so that the distribution of water is at the rate of 3½ gallons per head. To construct a cistern after the Venetian fashion, a large hole is dug in the ground to the depth of about nine feet, the infiltration of the lagoons preventing their going any deeper. The sides of the excavation are supported by a frame work made of good oak timber, and the cistern thus has the appearance of a square truncated pyramid with the wider base turned upwards. A coating of pure and compact clay, a foot thick, is now applied on the wooden frame with great care; this opposes an invincible obstacle to the progress of the roots of any plants growing in the vicinity, and also to the pressure of the water in contact with it. No crevices are left which might allow the air to penetrate. This preliminary work being done, a large circular stone, partly hollowed out like the bottom of a kettle, is deposited in the pyramid with the cavity upwards; and on this foundation a cylinder of well-baked bricks is constructed, having no interstices whatever, except a number of conical holes in the bottom row. The large vacant space remaining between the sides of the pyramid and the cylinder is filled with well-scoured sea-sand. At the four corners of the pyramid they place a kind of stone trough covered with a stone lid pierced with holes. These troughs communicate with each other by means of a small rill made of bricks and resting on the sand; and the whole is then paved over. The rain-water coming from the roofs runs into the troughs, penetrates into the sand through the rills, and is thus filtered into the cylinder or well-hole by the conical holes already described. The water thus supplied is perfectly limpid, sweet, and cool.

Transatlantic Gas Companies.—We gather from the *American Gas Light Journal* some particulars touching the statistics of gas light companies at the other side of the Atlantic. In the United States there are 381 companies with a capital of 47,911,215 dollars; in the British Provinces there are 23 companies with a capital of 2,112,040 dollars, whilst in Cuba, Mexico, and South America there are 19 companies whose capital amounts to 6½ million of dollars. The price in the United States varies from three to ten dollars the thousand feet, according to the distance of the place of manufacture from the mine. The paucity of gas works (says the journal referred to) on this extended continent must strike every reader. Take New York for instance—the Empire State of the North American Confederation, with its area of 46,000 square miles or 30,080,000 acres, of which 15,000,000 are improved; its extreme length nearly 480 miles, and its breadth 310 miles; with a population of at least 4,000,000, distributed in nearly 800,000 of families, occupying, perhaps, 600,000 dwellings, in 45 counties, with 71 gas works to light them up. That is not much more than a gas work to every county in the State. New York is filled with populous and thriving cities, towns and villages, every one of which—we need hardly except one, whose inhabitants number 500 persons—can support gas works. Look at Pennsylvania, with an equal area of territory—46,000 square miles or 29,440,000 acres, of which some 10,000,000 are improved, and about 4,000,000 of population. Pennsylvania has 63 counties and but 48 gas works, and yet we believe the actual capital in gas works owned in Pennsylvania is greater than in any other State, not excepting New York. Massachusetts has 49 gas works, with a territory to light up of 8,000 square miles or 5,000,000 of acres, of which, perhaps, 2,500,000 are cultivated, and a population of about 2,000,000. Illinois has 55,400 square miles of area and 13 gas works. No State in the Union is more blessed with jaunty little towns and enterprising people. Everybody goes to Illinois to work, and it is time they set to work at striking a light. Ohio measures, in area, 40,000 square miles, and numbers 87 counties. She has 30 gas works, but then Ohio is full of pigs, and it would be a reflection upon that useful branch of illuminating material to slight their well-tried ability to keep the wick-ed portion of the community from utter darkness; we do not propose, therefore, to grumble at Ohio. Great Britain, on the other hand, has 88,000 square miles and about 1,100 gas works. Why is it that Great Britain, with not twice the area of territory contained in the single State of New York, should have fifteen gas works to our one, and three times as many on her little island as there are in the whole United States combined? We have, surely, plenty of money and abundance of enterprise.

The Manchester Association for the Prevention of Steam Boiler Explosions.—At the montly meeting of the executive committee of this association, Mr. H. W. Harman, C.E., chief inspector, presented his report, from which the following are extracts:—"We have made 251 visits, examined 669 boilers, and 500 engines; of these, 8 visits have been special, 17 boilers specially, 16 internally, and 38 thoroughly examined; 14 cylinders have been indicated at ordinary visits. The general defects may be thus stated: Fracture, 7 (2 dangerous); corrosion, 11 (2 dangerous); safety-valves out of order, 37; water-gauges, 5 (3 dangerous); pressure-gauges, 11; feed apparatus, 2; blow-off cocks, 4; fusible plugs, 3; furnaces out of shape, 13 (1 dangerous); over pressure, 6 (3 dangerous); blistered plates, 5; total, 104 (11 dangerous). Boilers without glass water-gauges, 14; ditto pressure gauges, 6; ditto blow-off cocks, 12; ditto back pressure-valves, 82. No circumstance has occurred during the past month that calls for particular remark. The incrustation in boilers, especially that composed of sulphate of lime, and forming a hard scale on the plates, continues to give considerable trouble and annoyance, and the various attempts that have been made to counteract this deposit have proved unavailing. Doubtless Dr. A. Smith's recommendations, contained in the report distributed to our members, would neutralise it, but the difficulty is in obtaining the necessary antidote, in such a commercial shape, as shall render it easy of acquirement, at a moderate cost, and effective in quality. Several compositions have been lately tried, and from the success obtained in some instances, I have been induced to countenance, if not recommend, their adoption in others, but I regret to add without any satisfactory result. Whether this has arisen from the bad quality of the material supplied, or from adverse chemical combinations with the water used, I am unable to determine. But as manufacturers of these compositions are naturally desirous of securing my approval as your representative, I take this opportunity of cautioning our members against any representations of the kind, as although I am fully impressed with the importance of the subject, yet at this moment I do not know of any composition that will remove or even mitigate the effects of the deposits alluded to. Whenever I can conscientiously do so, I shall only be too happy in making this association the medium of affording such information to its members. The necessity of strengthening all boiler flues by encircling them with hoops of angle or T iron, seems at last to be more generally recognised. Any plan, however, by which the tendency of flues to collapse can be effectually guarded against, should be hailed with satisfaction, as rendering explosions of less frequent occurrence, and demanding but periodical and proper inspection to ensure entire safety.

Tramways for Passengers.—Although the Americans have been the first amongst the moderns to introduce street railways into their large cities, there is nothing new after all in the system, except its application for passengers. A century ago tramways were used in England. Cæsar's military roads from hill to hill, still mark the Roman's track. First, pack-horses transported the products of the land from place to place. Even a hundred years ago this was the custom in Scotland; in fact, in some places in the Highlands, and in some of the hilly parts of Wales, it is the practice of to-day. Wooden sledges drawn by horses succeeded. Then wheeled carriages, afterwards wooden tramways, and last came, what the Egyptians used in the age of the pyramids, and the Chinese during the Christian era, canals; the first in England was made in 1756. The Asiatic practice of laying down timber in bad roads most likely introduced the wooden rail. Down to the Elizabethan age, coals from Newcastle were taken in carts or on paniers to the sea. Two tons were a good load for one horse on the wooden rail. This is now about the weight of a passenger car. In 1738 cast iron rails succeeded wood. In 1752 iron wheels were made, but the carriages were not linked together till 1763. Six tons of rails were made by the Colebrook Dale Company for their tramway on the 13th of November of that year. In 1805 malleable rails were made at Wall-bottle Colliery, Newcastle-upon-Tyne. After horse-power, came steam. Savery reduced to practice, in 1663, the Marquis of Worcester's suggestion, in the "Century of Inventions." Newcomen made improvements in 1707. The cylinder and piston high-pressure engine came in 1720. These engines were used to pump water, but Dr. Robertson suggested to Watt, in 1759, the idea of making steam move wheel carriages. The "Surrey Iron Railway Company," in 1801, was the first railway act passed in the kingdom. In the year that Wellington and Napoleon were born, 1769, Hornblower introduced his patent. In 1782, Murdock made his model engine. Trevithic and Vivian, in 1802, reduced theory to practice, and obtained a patent for propelling by steam. The first trial was on common roads. Thousands saw the experiment where the

* See engraving at page 118 for August.

Euston Square station now stands. Woolf made improvements in 1804, but George Stephenson, just before the battle of Waterloo, invented the steam blast, which was the life-blood of the steam engine. Five hundred pounds premium was offered in April, 1829, by the Directors of the London and Manchester Railroad, for the best locomotive engine, to draw three times its own weight over a level plain ten miles an hour, weight not to exceed six tons, to cost not over five hundred and fifty pounds. October 6, 1829, was the first trial day, and imagine the sensation produced by the engine running twenty-eight miles an hour! The last day of that year, the first railway in England was opened for passengers. On the 4th December, 1830, Stephenson's engine, the "Planet," took one hundred and thirty five bales of cotton to Manchester. Thirty years later there were ten thousand miles in England, and in America, five thousand miles more of railway in active operation than is necessary to circumnavigate the globe.

Improvements in London.—The Thames Embankment Committee, appointed by the House of Commons, have presented their report. In connection with the matters referred to them, they have considered it necessary to inquire into the mode proposed for constructing the low level sewer about to be made by the Metropolitan Board of Works, and they found that if that sewer were carried under the Strand and Fleet Street, it would cause a vast amount of injury to the trade and traffic of the district, which it is scarcely possible to estimate. The importance of providing for the construction of the low level sewer in connection with the embankment has been recognised by the various engineers whose plans have been submitted to them; and provision is made in all these plans for constructing the low level sewer along the foreshore of the river and within the embankment. The committee have had many plans before them, out of which they have agreed to select the three presented by Messrs. Bazalgette, Bidder, and Fowler, civil engineers. All of these comprise the plan of including in the embankment the low level sewer on the north side of the Thames, the embankment to extend from Westminster to Queenhithe—that is, from Westminster Bridge to London Bridge. All the plans comprise a railway and a roadway—in two of them on the same level, and in the third on different levels. The wharfs are not to be interfered with, but, on the contrary, to be improved by the construction of docks and other facilities within the embankment. The committee has rejected the proposition to attempt to make it a public company, and recommend that, as the Legislature have already intrusted the main drainage of the metropolis to the Metropolitan Board of Works, by the 21st and 22d Victoria, cap. 104, sec. 11, and armed them with powers to deal with the foreshore of the river in connection therewith, the construction of the embankment should also be entrusted to them. They recommend that, in aid of the funds already voted for the sewer, the coal and wine duties, which are to expire in 1861, should be renewed for a limited time, and the proceeds be applied to the expenses of the embankment. The whole expenses of the embankment, including sewers, &c., are estimated at £1,000,000. One-fourth of this, at least, would be the cost of the length of sewer to be made. Indeed, it would be much more if it ran under Fleet Street and the Strand. The rest is to be raised by the renewal of the 8d. and the 1d. coal tax, and the wine duty of ½d., from which an annual sum of £100,000 may be expected, and the committee recommend that the cost of the embankment should be a first charge upon these duties.—The committee on the South Kensington Museum have proposed an additional grant for public buildings there of £27,000 a year, to be applied to the construction of a building of a more beautiful and permanent nature, and erected so as to be part of any future plan for a uniform collection. It is proposed to remove from the British Museum only the mediæval part of the collection, and such duplicates and superfluities as cannot find room in Bloomsbury.

The Colonies of Australia, Tasmania, and New Zealand.—The population of colonists in Australia amounted, at the end of 1858, to upwards of 1,100,000. Of these, the largest portion was in Victoria, which had 504,000. The deficiency of female population, which was gradually disappearing prior to the gold discovery, has been again increased by that event. In Victoria, there are still only sixty females to a hundred of the other sex. The aborigines everywhere exhibit the result of a rapid decrease before European colonisation. This seems more conspicuous with the Australian than with the New Zealander. The South Australian census of 1855 gave the aborigines of the settled districts as 3540, and this scanty number, as stated in official despatches, is thought to have been since reduced by more than one half: in Victoria, in 1857, there were 1768. The protector of the aborigines of that colony estimated their numbers about twelve years previously at 5000. An estimate of the number of the New Zealand aborigines was made by the native protector in 1844, in which it was stated to be 109,550. A more careful census in 1857 gave their number at 56,049, of whom 31,667 were males, and 24,303 females. Upon other and less doubtful data, such as the paucity of children, it appears certain that the race is rapidly decaying. The Northern Island, by its genial climate the most attractive to savage life, contained much the greater part of this people, no less, indeed, than 53,056, leaving the small remainder scattered over the cooler regions of the Middle and Southern Islands and the Chatham group. The Tasmanian aboriginal is on the eve of total extinction. He exhibits distinctive features alike from the Australian and New Zealander. Fourteen only survive out of 5000, the estimated numbers 57 years ago, on the first occupation by our countrymen. The improvements that are being effected in the larger towns must sensibly diminish the high ratio heretofore observable of urban mortality. Sydney and Melbourne are both now well supplied with good water, and in the former city an extensive system of underground drainage is far advanced towards completion. Infant mortality has long been unusually large in Melbourne. In South Australia, for 1858, the mortality under ten years of age amounted to 69·28 per cent. of the total of registered deaths. An established feature seems to be the greater mortality in the warm as compared with the cool seasons of the year. The lunatic asylums show prominent statistics in the two older colonies. We must doubtless attribute the large number of insane in New South Wales and Tasmania to the presence of the last elements of the convict system. In the former it is 1 in 518; in the latter the still higher ratio of 1 in 482; while in England it is about 1 in 700. The habits of criminal life have sent many either to premature graves or to the asylum. The proportion in Victoria for 1858 is only 1 in 1000, which contradicts the common opinion that the excitements of a gold-mining life, and the great consumption of ardent spirits in a climate unfavourable to such indulgence, contribute in unusual degree to insanity. The ratio for 1857 was still smaller than for 1858; but the cause is explained with reference to improved arrangements for transmitting lunatics from the country prisons to the asylum near Melbourne; and possibly to some slight extent the results of 1858 may still be similarly affected. The South Australian asylum presents only 39 subjects for 1857, and 40 for 1858, with a population of from 110,000 to 118,000 for these years. The ratio of crime is very considerable in all these colonies. The remains of the transportation system on the one hand, and, on the other, the great indulgence in alcoholic drinks, stimulated by a variable and rather warm climate, and generally abundant wages and means, may account for this unsatisfactory circumstance. To no small extent, also, must it be associated with the gold fields, which, in Victoria, are the great focus of crime. But the ratio has sensibly diminished since the earlier years of the gold mining.

Crimes of remarkable atrocity are committed mostly by the old British convicts, the remnants of the transportation system. The civil legislation presents some features of a specially colonial and Australian character. The measure entitled "A Preferable Lien on Wool, and Mortgage on Live Stock Act," was enacted by New South Wales about sixteen years since, and adopted by Victoria and South Australia. Attention is called to it as being contrary to the recognised principles of English law, which forbid a mortgage, without transfer of possession, of moveable property, and as having been, in consequence, disallowed by the Home Government. It was, however, successively re-enacted in the colony for short periods, and continues on the statute-book of several of the colonies. The measure has been beneficial, judging by the extent to which it has been used in the pastoral colonies that have introduced it. In Victoria, during 1859, the amount involved under this Act was so large as £1,196,571, while the amount under mortgage upon real property was £2,093,609. In New South Wales, for the previous year, the sums are respectively, £1,102,000, and £705,000, showing still more significance. The Gold Act of South Australia was an instance of exceptional procedure under the emergency of these times. The exodus of the labouring classes from that colony for Victoria, in 1852, brought on a panic, much enhanced by the diminution of specie, as the emigrating throng realised and carried off their means. The object of the Act was to make uncoined gold, assayed to a certain standard, a legal tender in South Australia, at a value slightly in excess of the then market price in Victoria. The price thus fixed—71s. per ounce—was below that of the intrinsic value, but it was also above the price of the market in Victoria, which the circumstances at the time had established. The object was attended with entire success, and many distressing circumstances that must have occurred from the further course of the crisis were prevented. The question of simplifying law with ragard to the tenure of landed property, which has been so often debated in Britain, has received its first practical solution in South Australia, where an extensive agricultural and landowning interest have already appreciated the important change. Mr. Torrens, in 1858, carried through the legislature his "Act to simplify the Laws relating to the Transfer and Encumberance of Freehold and other Interests in Land." The provisions of it are similar to, and anticipated, the recommendations of the Commissioners on Registration of Title, contained in a Report to Parliament dated in May, 1857, as to the transfer, leasing, mortgage, encumberance, and settlement of real estate; and the Act is similar to that of Sir Hugh Cairns' Bill of 1859. The colonial Act, however, differs in some points; for example, in this, that a good holding title, undisputed after extensive public notice, confirms the possessor against any future ejectment, leaving him subject only to the payment of compensation. The Act already promises favourably, and Victoria is discussing the adoption of its provisions. By its aid expenses are reduced to one-tenth, and proceedings are so simplified and time so saved, that parties can, unaided, transact their own business in real estate, and can generally complete a transaction within an hour. All the colonial territories, with one exception, have been declared Crown property, to the extinction of all native title. They are, therefore, known as Crown lands or waste lands, in contradistinction to the alienated territory which has been granted or sold to the colonists, and which still bears but a small proportion to the remaining Crown domain. The exception is that of the northern island of New Zealand, where the British Government have recognised the native title to the territory, with the provisio, however, that the tribes can sell only to the Government. This restriction and the intricacies of native ownership have occasioned many differences, and are more or less the cause of the present outbreak at Taranaki. All lands intended for sale in the Colonies, exclusive of New Zealand, are disposed of by public auction, or at least they must, in the first instance, pass that ordeal; and they are not sold for less than 20s. per acre, excepting in the case of Tasmania, where, by a recent Act, the pastoral lands may be sold for 10s. per acre. In New Zealand the land is disposed of upon terms which are different in each province, varying from 5s. to 40s. per acre. There is a complete system of registration of titles in each of these colonies. Education occupies a large measure of the attention of the colonial governments, and both systems—the denominational and the national—receive State support. Various endeavours have been made to introduce one general system, but hitherto without success. To the Universities of Sydney and Melbourne the Imperial Government has awarded the distinction of ranking their degrees upon an equality with those of similar home institutions. The scholarships recently established by Tasmania exhibit another feature in intellectual progress. The public library at Melbourne is an institution upon a large scale, and, by giving the utmost facility to visitors, has obtained marked success.

Statistics of Life.—The estimated population of Great Britain in the middle of 1858 was 22,626,334, and the excess of births over deaths in the year 246,488. 759,676 children were born alive, 351,346 persons were married, and

513,188 died; so that, on an average, upon every day in the year 2,080 children were born, 962 persons married, and 1,405 died, leaving a gain of 675 as the result of the day. The birth rate for Great Britain was 33·57 to 1,000 living, the death rate 22·68, the marriage rate (persons married) 15·52. For easy recollection it may be noted that rather more than twice as many are born in a year as are married, and the deaths should not be so high as midway between those two numbers. To 1,000 people living in the two countries the births in the year were 34 in Great Britain, 27 in France—a very striking difference; the deaths 23 in Great Britain, 24 in France; the persons married 15·5 in Great Britain, 16·9 in France. In Scotland the marriages, if all registered, were not so numerous as in England; the births were almost exactly at the same rate; but the percentage of deaths in Scotland was only 2·407, in England 2·303. Turning now to England and Wales only, we learn that to every 1,000 girls 1,045 boys were born, and 102 males died to every 100 females, the average of 21 years being 103; but there are more females living in England than males, and out of equal numbers living 105 males died to every 100 females, the average being 107. The births are always most numerous in the first half of the year; in 1858 they were as 2,091 to 1,909, in the two half-years. To every 100 women living of the age of 15-45 there were 14·3 births in the year. 43,305 children were born out of wedlock in 1858, or one in every 15 of all the children born alive; 106·2 boys were born illegitimate to every 100 illegitimate girls, while among children born in wedlock the boys were only 104·4 to 100 girls. The marriages in 1858 were below the average. Marriages are celebrated in England and Wales in 12,350 churches, and in 4,072 chapels not belonging to the Establishment, 505 of these being Roman Catholic. There were 128,082 marriages celebrated in churches, and 27,988 otherwise, 6,643 being of Roman Catholics, and 9,952 in the Registrar's office, and not at any place of religions worship. The marriages of minors increase. The proportion of minors in 10,100 persons marrying increased from 885 in 1843 to 1,212 in 1858. To every 130 marriages in 1858 by license there were 728 by banns, which may be taken as the proportion of marriages of the higher and middle classes to those of the lower. In 1841, 41 in 100 of the persons married had to sign the register with their mark; in 1858 only 32; the improvement is most striking among the women. In 1858, 73 in 100 men, and 62 in 100 women, wrote their names on this important occasion. The mortality of the year was high. The deaths in the chief towns were at the rate of 2·655; in the country districts, 2·006. The deaths in the army abroad were more than usual, in consequence of the Indian mutiny. The average strength of the army abroad was 111,730, and the deaths abroad was no less than 7,363—more than double the number in the previous year, when the strength was 77,676. The number of merchant seamen at sea in 1858 is calculated at 177,832, and 3,486 deaths at sea among this body were reported to the Registrar-General of Merchant Seamen, with an account of their effects. This would be 19·6 in 1,000—a high rate among men of their age and physical advantages. This return does not include seamen dying ashore in foreign parts; the account of their effects is sent to the Board of Trade by the consuls. The captains of vessels return the births of 112 English subjects in British vessels at sea, and 390 deaths.

	England and Wales.		France.	
	1854.	1858.	1854.	1858.
Estimated population,............	18,618,760	19,523,103	36,155,682	36,387,679
Marriages,............................	159,727	156,070	270,906	307,218
Births,.................................	634,405	655,481	923,461	967,638
Deaths,................................	437,905	449,656	992,779	872,622

Mathematics as a Study.—Mathematics, pure and applied, require very long and ardnous stndy, inasmnch as they have peculiar nomenclature, language, and processes; and thus it is only to the few generally who have made them their particular stndy, that they offer great interest. Mathematics have also now become so large in their grasp and so curious in their details, that the whole of a man's life is not sufficient for more than one branch of them. Indeed, some are devoting whole lives, and intellects too of the highest order, to the advancement of our knowledge in a particular direction. Take, for instance, the theory of homogeneous forms, in the history of science the names of Boole, Cayley, Sylvester, will always be recorded, and in scientific treatises their labours will find a place. Or take, again, the theory of elliptic functions, or the calculus of probabilities, the difficulties of these subjects require the utmost tension of the human mind, and even then they transcend its limits. These theories have a deep and pregnant meaning. Be assured, too, that they are not uninteresting to all: to many they give the purest pleasure, very frequently our knowledge of natural phenomena depends on certain integrals, the properties of which can only be studied with a profound knowledge of the higher mathematics, and thus the progress of one branch of knowledge depends on, and is frequently stopped by our ignorance of, another. To most of us, probably, the questions of applied mathematics will have greater interest; we are more familar with the laws of nature, the mathematical interpretation of which, mixed mathematics, as they are called, take cognizance of; we most eagerly catch at the results of those laws. Consider the Newtonian law of gravitation in its most general form, in its highest development in the lunar and planetary theories. The lunar disturbances have been, as you know, calculated with greater precision than heretofore, and new results have been arrived at, which exhibit certain discrepancies relative to the old. Mathematicians, however, have been startled by an announcement that, "what is commonly called mathematical evidence is not so certain as many persons imagine, and that it ultimately depends on moral evidence;" and, moreover, we are told that the "results of long and complicated mathematical calculations are not more than probably true." This we can hardly believe. It takes us quite by surprise; and we hope for further light. If, however, we must wait for light, we must wait patiently; let us not forestall a conclusion which many of us venture to think is as yet—not to say more—unproved; let us wait for the new lunar theories, which are as yet unpublished, and for the new lunar tables, which are the results of these theories. We are told, however, already that Baron Plana has corrected his calculations, and that he finds the results arrived at by Delaunay and Adams are in accordance with his amended formulæ. These new lunar calculations have taken us by surprise; but we would say, let us wait: "*Magna est veritas et prævalebit.*"

Victoria Station and Pimlico Railway London.—The works are nearly completed, and the railway, which is only about 1¼ mile long will shortly be opened to the public. The following account of the station and railway has been given by the *Times*:—The Victoria station is situated at the end of Victoria Street, about a quarter of a mile from Buckingham Palace. The ground upon which the temporary station buildings are now being erected was formerly occupied by the basin of the Grosvenor Canal, and covers about 10½ acres. This space is divided in the centre, one half being appropriated to the London, Brighton, and South Coast Railway Company, and the other half to the London, Chatham, and Dover, and the Great Western Railway Companies jointly, and for which purpose the mixed gauge has been laid not only on this portion of the station, but over the main line. The Brighton station covers about five and a quarter acres, having eight arrival and departure platforms of considerable length, and capable of accomodating a very large traffic. From this very extensive double station various lines diverge, by means of numerous switches and points to the main line, which is constructed on the mixed gauge. It passes under the Belgrave Road, which is carried over the railway by means of the Eccleston-bridge, of five openings, composed of wrought iron girders, supported on pillars, and extending 235 feet over the railway. The line from the station is nearly level, following the course of the Grosvenor Canal, and enclosed by well constructed high walls, and covered over by a light iron and glass roof for an extent of about half a mile. This has been done with a view to protect Mr. Cubitt's property, through which the line passes, from the noise of the trains, and, as a further precaution to prevent noise on this portion of the line, thick sheets of vulcanised India-rubber are placed between the rails and the longitudinal sleepers. Emerging from the roofed portion of the line near the iron bridge which carries Ebury Road over the railway, a rising gradient of 1 in 64 commences, and with some curves brings the line to the level of the carriage-way of a very handsome and substantial wrought iron bridge over the Thames. The railway from the south end of the bridge descends by a gradient of 1 in 60 to the junctions at Battersea with the West-end and Crystal Palace Railway on the one hand, and the West London Extension Railway on the other, and over which the broad gauge trains will pass to and from the Great Western Railway. The chief work on the line is the bridge over the Thames, and this, from its peculiar construction and the rapidity with which the works have been executed, deserves some notice. This bridge, which carries the railway over the river, including the land openings, extends 920 feet in length, and consists of two stone abutments at each side of the river, and three piers in the river, supporting four arched spans of 175 feet each. There are two land openings of 70 feet span, one at each end of the bridge, carrying the railway at a height of 16 feet over the roads on to the bridge over the Thames. The height above Trinity high water to the under side of each arch is 22 feet, and to the springing of each arch 4 feet 6 inches, making the rise of the arch 17 feet 6 inches, or one-tenth of the span. The three piers in the river are each 12 feet wide at the springing, and the two abutments are each 18 feet thick at the surface of the ground. The two land piers are each 10 feet wide. Cofferdams were used for the foundations of the piers and abutments, the piles for which were driven to a depth of 15 feet below the level of the clay, which was found at an average depth of 30 feet below high-water level. The foundations of all the river piers were carried down to a *minimum* depth of eight feet into the solid clay, and were commenced by laying a bed of concrete four feet thick, composed of one part of Portland cement to seven of clean river gravel. Upon this concrete two courses of Yorkshire rag landings each one foot in thickness were laid. Upon this a course of brickwork set in cement was laid to the level of 18 inches below the lowest water, and from that level to the springing of the arched ribs the masonry is faced with rock surfaced Portland roach stone set in lias lime. All the masonry above the springing level, the mouldings, and ornamental work, consist of Bramley Fall stone, from near Leeds. The four principal openings of the bridge are each spanned by six arched ribs of wrought iron, springing from cast-iron bed-plates fixed in the masonry of the piers and abutments. The spandrils or intermediate spaces between the arches and the horizontal girders under the roadway are filled in with wrought iron framework, radiating from the arch. The width between the parapets of the bridge is 32 feet, allowing space for two lines of mixed gauge railway, and the level of the rails is 24½ feet above Trinity high water. The quantities of materials used in the construction of the bridge have been as follows:—197,800 cubic feet of timber, used temporarily in gantries and cofferdams, and 16,800 cubic feet in floors; 10,700 cubic feet of York landings; 4,050 cubic yards of concrete; 6,500 cubic yards of brickwork; 23,857 cubic feet of Portland roach stone; 57,205 cubic feet of Bramley Fall stone; 1,296 tons of wrought iron and 225 tons of cast iron. The total cost of the bridge will be about £90,000, or £3 per square foot. The works of the bridge were designed and constructed under the immediate superintendence of Mr. John Fowler, the company's engineer in chief, and Mr. William Wilson, the assistant engineer. Mr. Kelk was the contractor. The strength of the bridge has been carefully tested by means of locomotive engines and loaded trucks, weighing together 350 tons, being equal to one ton per lineal foot on each rail. The load was placed over each opening, and also partly on the piers and openings. The deflections were observed at regular intervals, showing a gradual decrease from the centre of the openings to the piers, as might have been expected. The greatest deflection observed on the centre of the two middle openings of the bridge was one inch and one-fifth, and the greatest deflection observed on the two other openings was 0·94 of an inch. When the load was removed the bridge again resumed its original level, so that no permanent set was produced. Afterwards the load was placed partly on one arch, and partly on the next, the pier being in the middle, and in that position the deflection was very small. The trains were then run over the bridge, but no greater deflection was observed, and no permanent set was produced.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded March 17.

706. William N. Wilson, High Holborn—Improvements in floor sweepers.

Recorded March 23.

762. John Deane, and John Deane, jun., King William Street, and William Harding, Forest Hill, Kent—Improvements in breech loading fire arms,—(Communication from Capt. Alexander Delvigne, Les Ternes, Paris.)

Recorded March 24.

772. Isaac Blackburn, Long Eaton, Derby, and Parliament Street, Westminster—Improvements in the manufacture of iron and steel, and in making iron castings.

Recorded April 18.

974. John Fowler, Cornhill, William Worby, Ipswich, and David Greig, New Cross, Deptford—Improvements in tilling land, and in actuating agricultural implements by steam power, and in apparatus employed therein.—(Communication from Messrs. Schubart and Hesse, Dresden.)

Recorded April 26.

1044. Jean C. Durand, Brydges Street, Covent Garden—A new system of drainage for towns when affected by the tide.

Recorded May 8.

1136. William M'Donald, Hyde Park Barracks, Knightsbridge—Improvement in military saddles and in stirrup irons to be used therewith.

Recorded June 1.

1355. Thomas F. Newell, Cloak Lane, Cheapside—Improvements in punching the leaves of cheque and other books and other papers.—(Communication from Antoine Lapointe, Rue de l'Echiquier, France.)

Recorded June 4.

1364. William Taylor, Nursling, near Southampton, Hants — An improved hand light or portable green house, to be used for growing and protecting plants, either with or without artificial heat.

Recorded June 5.

1372. John Mabson, Sheffield, Yorkshire—Improvements in metal life buoys, also adapted for holding water or other liquids.

Recorded June 6.

1388. Charles Stevens, Welbeck Street, Cavendish Square—An improved mode of preparing various plants to be used in the manufacture of paper.—(Communication from Eugene Helenus, Paris.)

Recorded June 15.

1458. Bartolommeo Predavalle, Bloomsbury Street, Bloomsbury Square—A new mode of and apparatus for producing and obtaining motive power.

Recorded June 20.

1490. Anton Verwey, Saint Augustine Road, Camden Town—Improvements in the proportions of ingredients and mode of manufacture of a chemical compound for softening water.

Recorded June 22.

1516. Henry Palmer, Wakefield Terrace, Caledonian Road, Islington, and Henry S. Swift, Langbourn Chambers, Fenchurch Street—Improvements in the method of, and apparatus for, propelling, ships, vessels, boats, or other craft, in, on, or through the water.

Recorded June 26.

1554. John Fletcher, Farnham Place, Southwark, Surrey—Improvements in the apparatus for treating saccharine and saline solutions.

Recorded June 28.

1564. Christopher Binks, Parliament Street, Westminster—Improvements in manufacturing chlorine.
1571. William Clark, Chancery Lane—Improvements in machinery for cutting files.—(Communication from James C. Cooke, Middletown, Middlesex, Connecticut, U. S.)

Recorded June 30.

1586. Richard Laming, Clifton Villas, Maida Hill West, and Charles Smith, Gloucester Street, Regent's Park—Improvements in purifying certain gases and liquids from sulphuretted hydrogen.

Recorded July 2.

1590. Edward T. Hughes, Chancery Lane—Obtaining colouring matter from the lentisc or mastic tree.—(Communication from Christophe Muratore, Algiers, Africa, empire of France.)

Recorded July 4.

1620. John Savage, Pelham Street, Nottinghamshire—An improved means of or apparatus for threading needles.

Recorded July 5.

1624. Thomas Walker, Grove Cottages, Hill Street, Peckham, Surrey — An improved collapse detector pocket, for protecting articles worn on the person.
1626. Serge Krotkoff, Welbeck Street, Cavendish Square—Improvements in apparatus for employing the electric light.

Recorded July 6.

1636. Benjamin Mitchell, Crowe Hall, Denver, Norfolk—An improved machine applicable for harrowing, weeding, hoeing, and other agricultural purposes.

Recorded July 9.

1644. Richard Pollit, Bolton-le-Moors, Lancashire—Certain improvements in the construction of steam boilers.
1645. John J. Taylor, Cottage, Tucks Gardens, Sloane Street, and George Butler, Carlton Street, Kentish Town—Improvements in apparatus for stamping, printing, and embossing.
1646. Leopold C. Warneck, Place du Pilori, Nantes, France—An improved method of treating the coffee husk for purposes of nutrition.
1647. Joseph Townsend, and James Walker, Glasgow, Lanarkshire—Improvements in obtaining sulphur, sulphite, and hyposulphite of lime, and oxide of manganese from bye or waste chemical products.
1648. Henry Disston, Laurel Street, Philadelphia, U. S.—Improvements in hand saws.
1649. George F. Forbes, Inverness—Improvements in machinery or apparatus for cleaning cotton.
1650. Jacques C. Malfille, Bordeaux, France—An improved elastic band for sustaining and tighteuing pantaloons, waistcoats, drawers, petticoats, or other dresses.
1651. Richard A. Brooman, Fleet Street—Improvements in railway breaks.—(Communication from Jean Jan, called Paulet, Canet, France.)
1652. Floride Heindryckx, Northumberland Street, Strand, Westminster—Improvements in the construction of the permanent way of railways.
1653. Alfred V. Newton, Chancery Lane—Improvements in the construction of portable ovens.—(Communication from Paul Plisson, Bayonne, France.)
1654. William H. Prichard, St. Luke's—An improved apparatus for amusing and exercising children, and assisting them in learning to walk.

Recorded July 10.

1655. Robert Wilson, Glasgow, Lanarkshire—Improvements in the finishing and folding of textile fabrics.
1656. Thomas P. Joderson, Eastcheap—Improvements in life boats.
1657. Marc A. F. Mennons, Rue de l'Echiquier, Paris—An improved steam boiler.—(Communication from Adolph Keifler, Copenhagen, Denmark.)
1658. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Improvements in the construction and arrangement of apparatus for obtaining motive power from heated compressed air.—(Communication from Frederic Guibe, Toulouse, Garonne.)
1659. Alfred Green and William H. Glover, Stourbridge, Worcestershire—An improvement in water tuyeres.
1660. Ferdinand C. Warlich, London Street, Fenchurch Street—Improvements in the manufacture of artificial coal fuel, and in apparatus employed in such manufacture.
1661. Swiatoslar Zoubtchaninoff, Boulevart de Batignolles, Paris—A cement to prevent the leaking of all liquids, and also dampness in buildings.
1662. Swiatoslar Zoubtchaninoff, Boulevart Batignolles, Paris—An improved compound for the coating of wooden ships, boats, and other structures used at sea.
1664. George Speight, Woodbridge Street, Clerkenwell—An improved means of protecting watches and other small portable articles from being stolen from the person.

Recorded July 11.

1665. Eugene Franquinet, Angree, Belgium, and South Street, Finsbury—Improvements in the machinery or apparatus for rolling iron.
1666. William K. Hall, Cannon Street—Improvements in gas regulators.—(Communication from Calvin T. Herring, St. Louis, U. S.)
1667. Thomas Trotman, Crimscot Street, Grange Road, Bermondsey, Surrey—An improved dress fastening.
1668. William Clark, Chancery Lane—Improvements in steam engines.—(Communication from Mr. Charles C. E. Minie, Paris.)
1669. Robert Walker, Glasgow, Lanarkshire—Improvements applicable to horse bits.
1670. George Davies, St. Enoch Square, Glasgow, Lanarkshire—Improved apparatus for supplying steam boilers with water.—(Communication from Messrs. Gargan and Co., Paris.)
1671. Arthur Smith, Glasgow, Lanarkshire—Improvements in the material for sizing or dressing yarns preparatory to weaving.
1672. John Webster, Leicester—Improvements in the construction of circular knitting machinery.
1673. John Davies, Cinderford, Gloucester—Improvements in apparatus for the prevention of accidents at mines or pits.
1674. James Jack, Liverpool, Lancashire—Improvements in the construction and arrangement of surface condensers for marine and land steam engines.
1675. Samuel Povah, Liverpool, Lancashire—An improved combined portable steam-engine winch, and apparatus or machinery for operating the pumps and parts of the rigging, warping, raising the anchor, and for other uses on board ships where power is required, parts of the same being applicable for like uses separately.
1676. Paul Pizzi, Winsley Street—Improvements in preparing and treating the surfaces of the interiors and exteriors of houses, edifices, monuments, and other buildings, to imitate polished marble or stone, also rendering them impervious to the action of the atmosphere and other elements.

Recorded July 12.

1677. Joseph Gibbs, Brentford—Improvements in constructing submerged works.
1678. Edward T. Hughes, Chancery Lane—Improvements in shrouds or winding sheets.—(Communication from Monsieur Antoine Conche, Rue Adelaide Perrin, Lyons, France.)
1679. John Askew, Charles Street, Hampstead Road—Improvements in window sashes.
1680. Thomas Brearley, Dock Street, Whitechapel—Improvements in machinery for producing and revivifying animal charcoal.
1681. Peter Graham, Oxford Street—Improvements in means or apparatus for operating roller blinds.
1682. Henry Shaw, Dublin, Ireland—Improvements in means or apparatus for stopping railway trains.
1683. Frederick Ayckbourn, Mitcham Common, Surrey—Improvements in tubular beds and bolsters.
1684. Frederick Osbourn, Aldersgate Street—Improvements in the construction of endless saws and cutters.

1685. Francis Mordan, Goswell Road — Improvements in bottles, jars, or vessels for holding blacking, and in certain appurtenances thereof, part of the invention being applicable to stoppers for bottles used for other purposes.
1686. John Ferguson, Glasgow, Lanarkshire—Improvements in machinery or apparatus for sawing or cutting wood into veneers and planks.—(Communication from J. F. C. Wieland, Hamburgh.)

Recorded July 13.

1687. Perceval M. Parsons, Arthur Street West, London Bridge — Improvements in ordnance and fire-arms, and in tools for rifling the same.
1688. John W. Edge, Manchester, Lancashire—Improvements in rifled fire-arms, guns, and ordnance.
1689. Marie V. Boqnet, Boulevart de Strasbourg, Paris—Canisters or vessels, fitted moveable and hermetically stopping covers, for containing preserved alimentary or other substances.
1690. Charles T. Judkins, Ludgate Street—Improvements in sewing machines.—(Communication from Joseph W. Bartlett, Broadway, New York, U. S.)
1691. Francis J. Risse, Great Bland Street, Southwark, Surrey—Improvements in gun locks.
1692. Francis J. Rissie, Great Bland Street, Southwark, Surrey—Improvements in pressure gauges.
1693. George Anderson, Leadenhall Street—Improvements in singeing pigs, and in apparatus for the same.
1694. Andrew Strathern, Andrew Strathern, the younger, and Allan Strathern, Glasgow, Lanarkshire—Improvements in stop cocks or valves for regulating the flow of fluids.
1695. Charles G. Hill, Commerce Square, High Pavement, Nottingham—Improvements in machinery for the manufacture of bonnet fronts, ruches, and other millinery trimmings, or for other purposes.
1696. William Allen, Great Alfred Street, and William Allen, Carrington, Nottinghamshire—Improvements in the prevention of incrustation and corrosion of steam engine boilers.
1697. Michael Henry, Fleet Street—Improvemements in looms, and in the jacquard apparatus of looms.—(Communication from Messrs. François Durand and Henry A. Pradel, Paris.)

Recorded July 14.

1698. William Bragge, Atlas Steel Works, Sheffield, Yorkshire—Improvements in the manufacture of tyres for railway wheels.
1699. John Pile and John R. Smyth, West Hartlepool, Durham—Improvements in the preservation of iron surfaces from corrosion or decay.
1700. Henry G. Austin, Grange, Canterbury, Kent—Improved apparatus for propelling vessels.
1702. Thomas W. Miller, Her Majesty's Dockyard, Portsmouth—Improvements in the construction of tubular boilers or steam generators, and surface condensers and such like apparatus, and in the method of forming, applying, fitting and using, metal tubes for the same.
1703. Joseph and Samuel Lingford, Bishop Auckland, Durham—An improved machine for washing, drying, and dressing currants.
1704. Albrecht de Neviers, New Cremorne Road, Chelseo—Improvements in breech loading fire arms.
1705. Samuel T. Cornish, Beaumont Square, Mile End Road—Improvements in ships' closets.
1706. Jean Mechim, White Horse Road, Croydon, Surrey—Improvements in pianos and organs.—(Communication from Frederic S. Wiart, Chateauroux, Indre, France.)
1707. Maximilian L. J. Chollet, Rue Marbeuf, Paris—A solid alimentary compound for making soups, seasoning meats, made dishes, and vegetables.
1708. William E. Newton, Chancery Lane—An improved manufacture of waterproof leather.—(Communication from Samuel La Forge, Cleveland, Ohio, and Joseph Merwin, John E. Bray, and Asa G. Trask, New York, U. S.)
1709. Alfred V. Newton, Chancery Lane—Improvements in the construction of windlasses.—(Communication from Joseph P. Manton, Providence, Rhode Island, U. S.)
1710. Lewis Hope, Bishopsgate Churchyard—Improvements in knot-stitch sewing machines.

Recorded July 16.

1711. William F. Henson, New Cavendish Street, Portland Place — Improvements in railway carriage buffer and other springs.
1712. Frederick L. H. Danchell, Great Queen Street, Westminster—Certain improvements in filters.
1713. Samuel Ivers, Halshaw Moor, and Mark Smith, Heywood, Lancashire—Improvements in machinery for communicating motion to and for stopping looms for weaving.
1714. Alfred Smith, Manchester, Lancashire—Certain improvements in the manufacture of velvet or other similar piled fabrics.
1715. Samuel B. Rogers, Newport, Monmouthshire—An improvement in the smelting of iron ores.
1716. William Bauer, Borton Street, Burton Crescent—An improved diving bell.
1717. William Bauer, Borton Street, Burton Crescent—A new method of laying down and raising or cutting off for repairing and other purposes, of telegraph cables, chains or ropes.
1718. Alexander Bain, Clerkenwell Green—Improvements in means, apparatus, or articles for holding and supplying ink.
1719. Richard A. Brooman, Fleet Street—An improved clip for holding tickets and other articles.—(Communication from Paul Ducasse, Paris.)
1720. William Birks, sen., and William Birks, jun., Nottingham—Improvements in bobbin net, or twist lace machinery.
1721. Joseph Thiebaut, Whitechapel—Improvements in the ornamentation of textile fabrics.
1722. William E. Newton, Chancery Lane—An improved covering for roofs and walls.—(Communication from Rufus S. Lewis, Lowell, Massachusetts, U. S.)

Recorded July 17.

1723. Henry Gloag, Edinburgh, Midlothian—Improvements in breech-loading fire-arms and cannons.
1724. Charles Stevens, Welbeck Street, Cavendish Square—An improved method of preserving potatoes cut in pieces by a machine for that purpose.—(Communication from Vignal and Roustain, Paris.)
1725. James Henson, Watford, Herts and William F. Henson, New Cavendish Street, Portland Place, Westminster — Manufacturing canvas and other fabrics for tarpaulings, sacks, rick-cloths, ship sails, and for other purposes, and also for uniting the edges of the same.
1726. James Fletcher, Accrinton, Lancashire—Improvements in machinery or apparatus for regulating the supply and discharge of fluids to steam boilers, pipes, and other vessels, and for cleansing or cleaning the same.
1727. Leopold Unger, Chancery Lane—Improvements in the construction and arrangement of box irons, used by laundresses and others for pressing and smoothing clothes and fabrics.
1728. Francis C Seyde, Warren Street, Fitzroy Square—Improved mechanism for pulping, triturating, and comminuting for culinary and other purposes.
1729. George Spencer, Cannon Street West—Improvements in the means or apparatus used for lubricating valves and pistons, and other portions of locomotives and other engines worked by steam, air, gas, or vapour.—(Communication from Joseph Marks, Hamilton, Wentworth, Canada.)
1730. Adam C. Bamlett, Myddleton Tyas, near Richmond, Yorkshire—Improvements in reaping and mowing machines.
1731. Edward Loysel, Cannon Street—Improvements in locks or fastenings.—(Communication from Viscount de Kersolon, Paris.)
1732. Abraham Eskell, Grosvenor Street, Grosvenor Square—Improvements in beds, or bases for artificial teeth.
1733. Philip Vallance, Bolton Road, Abbey Road, St. John's Wood—Improvements in the construction of telescopic sights for rifles and other fire-arms and ordnance.
1734. Job Goulson, Ponsonby Terrace, Vauxhall Bridge Road, Westminster—Improvements in gas and other fluid meters.

Recorded July 18.

1735. Donald Skekel, West Square, Surrey—Improvements in pistons for steam engine and other cylinders, which improvements are also applicable to the buckets of pumps.—(Communication from Alexander Skekel, Demerara.)
1736. John Picksley and Reuben Sims, Bedford Foundry, near Leigh, Lancashire—Improvements in bone mills and logwood rasps.
1737. Prosper V. du Trembley and Andre D. Martin, Rouen, France—Improvements in broke-apparatus, suited for railway carriages and for other purposes.
1738. Thomas C. W. Pierce, and George F. S. Isherwood, Manchester, Lancashire—Certain improvements in power looms for weaving.
1739. Thomas Gray, Bridge Lane—Improvements in the manufacture of flock, such as is employed for flocking paper hangings, and for other purposes.
1740. Robert Oxland, Plymouth—Improvements in the manufacture of gunpowder.
1741. Samuel P. Jackson, and Albert Jackson, Ashley Place, Bristol—Improvements in the manufacture of window sashes, casements, and other frames suitable for glazing.
1743. James Hunt, Birmingham, Warwickshire—Certain improvements in hair-triggers, or detents for single or double barrelled guns or pistols.
1744. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Colouring matter, and the means of obtaining the same.—(Communication from Louis H. Obert, Rue Meslay, Paris.)
1745. Charles Stevens, Welbeck Street, Cavendish Square—An improved screw cutting machine.—(Communication from J. B. Derenne, Paris.)

Recorded July 19.

1746. Henry Holland, Birmingham, Warwickshire—An improvement in the manufacture of steel tubular stretchers for umbrellas and parasols.
1747. Isaac B. Shaw, Tunstall, and James E. Shaw, Burslem, Staffordshire—Improvements in the ornamentation or decoration of earthenware, porcelain, glass, and other articles, and in producing the designs, figures, patterns, and roller moulds used in such process, such roller moulds being also applicable for the casting of rollers used in typographic and lithographic printing.
1748. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in the manufacture or production of white lead, and in the machinery or apparatus employed therein.—(Communication from Georges H. Ozouf, Rue Meslay, Paris.)
1749. Isaac N. Davis, Brentford—Producing spirit from rice, maize, barley, or other grain.—(Communication from A. E. Ripoche, Rouen, France.)
1750. Alonzo B. Woodcock, Manchester—Improvements in the manufacture of moulded articles of vulcanised India rubber.
1751. William Barrett, Norton, Stockton-on-Tees — Improvements in machinery to be used when casting metals.
1752. John Stenhouse, Upper Brunswick Terrace, Barnsbury Road—Improvements in purifying coal gas.
1753. Timothy Tyrrell, Guildhall Yard—Improvements in the construction of tubular boilers.
1754. John Saxby, Brighton—Improvements in apparatus for and in the mode or method of working and governing railway points and signals.
1755. William Clark, Chancery Lane—Improvements in valve apparatus for regulating the flow of steam and other fluids.—(Communication from Charles A. Riff, and Antoine Laudenmuller, Paris.)
1756. William Clark, Chancery Lane—Improvements in stamping or embossing presses.—(Communication from Mr. Laurent Poirier, Paris.)

Recorded July 20.

1757. Charles W. Hahnel, Manchester—Improvements in the construction of parts of umbrellas and parasols.—(Communication from Louis Prang, Boston, U. S.)
1758. Joseph Dickinson, Pendleton, near Manchester, Lancashire—Improvements in machinery for retarding or stopping railway or other carriages, and for other purposes where breaks are applicable.
1759. John Broad, Ulverston, Lancashire—An apparatus for economizing coal and other fuel, to be used with hot or cold blast, in the smelting of iron ores and resmelting of pig iron.
1760. Robert Pinkney, Bread Street Hill—An improved pencil case.
1761. John Kenny, Litchfield Street, Soho—Improvements in sewing machines.
1763. Henry W. Poulter, Thayer Street, Manchester Square—Improvements in the arrangement and construction of printers' composing cases, and in the frames used therewith.
1764. Charles C. J. Guffroy, Lille Town, France—Improvements in preparing the livers of salt water fish.—(Communication from Augustin J. Despinay, Lille, France.)
1765. Alfred V. Newton, Chancery Lane—Improvements in the manufacture of apparatus for regulating the force of electric currents.—(Communication from Giovanni Casselli, Florence.)
1766. Caleb Bedells, Leicester—Improvements in the manufacture of braces.
1767. William Lake, Old Kent Road, Surrey—An improved button or fastening for iron bedsteads and other purposes.
1768. Ebenezer Hollis, Birmingham, Warwickshire—Certain improvements in muzzle-loading guns applicable for military and sporting purposes, parts of which are also applicable to certain descriptions of pistols and breech-loading guns, as also in the manner of fixing or connecting bayonets to military guns.
1769. James H. Young, College Street, Camden Town—Improvements in setting up (composing) and distributing type.

Recorded July 21.

1771. Samuel Roberts, Hull, Yorkshire—Improvements in harrows.
1772. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Improvements in the construction and arrangement of marine steam engines.—(Communication from Vincent Gache, senr., Nantes.)
1773. William E. Newton, Chancery Lane—Improvements in loom for weaving.—(Communication from M. Van Peteghem, Ghent, Belgium.)
1774. Alphonse R. Le M. Normandy, Odin Lodge, King's Road, Clapham Park, Surrey—Improvements in connecting gas and other pipes.

Recorded July 23.

1775. Richard Hewens, Leamington, Warwickshire—An improvement in kitchen ranges, which is also applicable to stoves in general.
1776. Henry Green, Bolton-le-Moors, Lancashire—Improvements in charging and drawing the charge from gas retorts, and in the machinery employed in performing such operations.
1777. Jean B. J. Noirot, Paris—An improved method of manufacturing India rubber tubes, and various articles.
1779. George H. Birkbeck, Southampton Buildings, Chancery Lane—Improvements in the construction of chimneys for lamps, or apparatus for transmitting light.—(Communication from Etienne Soulie, Paris.)
1780. Archibald Turner, Leicester—Improvements in the manufacture of elastic fabrics.
1781. John W. Sullivan, Adam Street, Adelphi, Westminster—Improved machinery applicable to washing and churning, and the mixing of fluids.—(Communication from Charles Sallivan, and William F. Hyatt, New York.

Recorded July 24.

1782. Henry Jones, Neath, Glamorganshire—Improvements in rails for railways.
1783. William Clark, Chancery Lane—Improvements in apparatus for setting and sharpening scythes and other like instruments.—(Communication from Mr. Pierre C. Ratel, Paris.)
1784. Andrew Robertson, Neilston, Renfrewshire, and Alexander Ritchie, Glasgow, Lanarkshire—Improvements in steam-boiler and other furnaces or fireplaces, in pyrometers, and in the prevention of smoke.
1785. Lewis le Richeux, Sussex Road, Brixton, Surrey—Improvements in the means of attaching buttons or studs to articles of clothing or other similar articles, and in the buttons or studs to be adapted thereto.
1787. Hermann Hirsch, Berlin, Prussia, and Bridge Road, Lambeth, Surrey—Improvements in screw propellers.
1788. Louis C. Macaire, Paris—A substitute for nitrate of silver, particularly applicable to photographic purposes.
1789. Rebecca Thomas, Bath Street, Tabernacle Square—Improvements in the tires of wheels for vehicles used on common roads.
1790. William Brunner, Printing House Square, and William H. Levett, Clare Street, Lincoln's Inn Fields—An improved apparatus for increasing the illuminating power of coal gas, also for economizing the consumption thereof, and for regulating the pressure from the street mains
1791. Alfred V. Newton, Chancery Lane—Improved means for relieving the slide valves of steam engines of unnecessary pressure.—(Communication from David Stoddart, San Francisco, California, U. S.)
1792. Robert A. Rumble, Trinity Square, Southwark—Improved apparatus for feeding fuel to fireplaces or furnaces.
1793. William E. Newton, Chancery Lane—An improved mathematical or plotting instrument, which he intends to denominate a protracting trigonometer.—(Communication from Josiah Lyman, Lenox, Berkshire, Massachusetts, U. S.)
1794. Sir Peter Fairbairn, and Joseph Barrow, Leeds, Yorkshire—An improvement in the construction of self-acting lathes.

Recorded July 25.

1795. William E. Taylor, Enfield, near Accrington, Lancashire—Certain improvements in looms for weaving.
1796. Eugene Hedou, Finsbury—Improvements in the manufacture of 'tar paper,' which improvements may also be applied to several other uses.
1797. Montague R. Leverson, Saint Helen's Place—Improvements in applying springs to locomotive engines, and to railway and other carriages.—(Communication from William H. Brown, Erie, Pennsylvania, U. S.)
1799. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Improvements in the processes of and apparatus for unwinding silk from cocoons.—(Communication from Pasquale Andervalt, and Giuseppe Piazzi, Trieste, Illyria.)
1800. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Improvements in etching on zinc.—(Communication from Edouard E. Raynal, and Emile Bellot, Paris.)
1801. Samuel J. Wilkinson, and George F. L. Meakin, Saint Mary Axe—Improvements in the construction of boxes, trunks, or packing cases, to be called 'The Plicabilis,' or folding box trunk or packing case.
1802. Thomas Hartley, Bury, Lancashire—An improved fibrous material for manufacturing woven fabrics.
1803. John Pilkington, Fish Street Hill—Improvements in means for protecting and making water tight exposed surfaces, such as railway arches, bridges, roofs, and other structures.
1804. Henry C. Ash, Claylands Terrace, Clapham Road, Surrey—Improvements in apparatus employed in cooling and freezing liquids.
1805. Charles W. Lancaster, New Bond Street, James Brown, and John Hughes, Newport, Monmouthshire—Improvements in the manufacture of plates for coating or covering and strengthening ships, and other structures, and in fixing the same.
1806. Jules L. L. Cambaceres, Paris—Certain improvements in treating fatty and oily matters.
1807. Alfred V. Newton, Chancery Lane—An improvement in the process of concentrating and crystallizing sugar.—(Communication from Horatio N. Fryatt, Belleville, Essex, New Jersey, U. S.)
1808. William Rose, Hales Owen, Worcester—Improvements in breech loading fire-arms and ordnance.
1809. Robert T. Smith, and Thomas Suckley, Whitechurch, Salop—Improved apparatus for smutting and screening grain, and distributing other granular substances
1811. Leonard Kaberry, Rochdale, Lancashire—Improvements in machinery or apparatus for preparing, spinning, and doubling cotton, and other fibrous materials.

Recorded July 26.

1812. Thomas M. Downing, Handsworth, Staffordshire—Certain improvements in tanks, vats, or vessels, to be used for holding, keeping, or storing of malt liquors, wines, spirits, and other liquids for human consumption.
1813. Joseph Thomson, Sheffield—An improvement in covers for jugs, also applicable to covers for other articles.
1814. Michael Henry, Fleet Street—Improvements in engines for obtaining motive power—(Communication from Francis Million, Boulevard St. Martin, Paris.)
1815. Gaetano Bonelli, Queen Square, Bloomsbury—Improvements in the manufacture of felted fabrics and paper.—(Communication from Jean Manzonia, Milan.)
1816. Amedee Gelis, Boulevard Saint Martin, Paris—Improvements in preparing compounds of cyanogen, and principally of prussiates, by means of sulphuretted carbamids or amids, which supply sulphurets of carbon, by their decomposition.

Recorded July 27.

1817. William Campbell, Hollinshead Hall, near Withnell, Chorley, Lancashire—Improvements in the form of steam ships.
1819. Charles A. Grossetete, Cranbourn Street, Leicester Square—An improved reversed conicle non-swerving spring mattrass.
1820. James Bishop, Gloucester Street, Gloucester Gate, Regent's Park—Improvements in kitchen ranges, and their boilers, and ovens, some of which improvements are also applicable to kettles and other utensils, or apparatus for heating or cooking.
1821. Edward Briggs, Castleton Mills, Rochdale Lancashire—The application of spun silk waste, made in winding and weaving, to manufacturing purposes, and improvements in machinery employed in operating on such silk waste.
1822. Edward Dugdale, Soho Foundry, Blackburn, Lancashire—Certain improvements in looms for weaving.
1823. Joseph Renshaw, Ordsal Lane, Salford, Lancashire—Improvements in machinery or apparatus for finishing velvets, velveteens, and other pile fabrics.
1824. Richard A. Brooman, Fleet Street—Improvements in belts.—(Communication from Henri Dollier, Paris.)
1825. Richard A. Brooman, Fleet Street—Improvements in the manufacture of linseed oil, and in apparatus for the same.—(Communication from Joseph P. Person, New York, U. S.)
1826. Samuel Terrill, Redruth, Cornwall—Improvements in open-air cooking apparatus.
1827. Joseph Olorenshaw, Coventry—An improvement or improvements in spectacle frames.—(Communication from Louis S. Fellows, New York, U. S.)
1828. Thomas Wilson, Birmingham, Warwickshire—Improvements in breech-loading fire-arms and ordnance.
1829. John Jeyes, Cheyne Walk, Chelsea—Improvements in the manufacture of boots and shoes.

Recorded July 28.

1831. John and George Dakin, Heywood, Lancashire—Improvements in machinery employed in covering top rollers, used in preparing, spinning, and doubling cotton and other fibrous materials.
1832. Henry Brown, and Brook Hodgson, Halifax, Yorkshire—Improvements in the manufacture of a certain cloth or fabric, commonly called 'Utrecht velvet.'
1833. George C. Hunt, Baltic Cottage, Rotherhithe, Surrey—Improvements in colouring bricks, tiles, and other similar articles.
1835. William Morris, Lambeth, Surrey—Improvements in the construction of ships or vessels, and in the mode of propelling them.
1836. Lawson Lansdell, Ipswich, Suffolk—Improvements in the manufacture of harrows.
1837. John Hamilton, Liverpool—Improvements in vessels to be propelled by steam power.
1838. George H. Birkbeck, Chancery Lane—Improvements in looms for weaving velvet or other cut pile fabrics.—(Communication from Elie Dominique, Paris.)
1839. John P. Hodgson, Pilgrim Street, Newcastle-upon-Tyne, Northumberland—An improved coffee-pot.
1840. James Ireland, Wambrechus, near Lillie, France—Improvements in machinery or apparatus for treating hemp, flax, tow, and other fibrous substances
1841. Jean H. Pape, Rue de l'Echiquier, Paris—Improvements in the construction of piano-fortes.
1842. Samuel A. Carpenter, Birmingham, Warwickshire—A new or improved adjuster for adjusting the backs of waistcoats and trousers, which said adjuster may also be used as a substitute for the fastenings ordinarily employed in fastening gloves, garters, and belts.

Recorded July 30.

1843. Louis Rome, Route du Pont de Fer, near Grenoble, France—A machine for the fabrication of fishing or other nets.
1845. James Rahill, Ramsgate, Kent—Improvements in quadrants, sextants, or other similar instruments to which artificial horizons are applicable.
1847. William E. Newton, Chancery Lane—An Improvement in brushes for the hair, or other purposes.—(Communication from John R. Ingersoll, New York, U. S.)
1849. Joseph Nicholson, Chaple House, Kensingham, Whitehaven, Cumberland—Improvements in reaping and mowing machines.
1851. Oswald D. Henley, Newcastle-upon-Tyne, Northumberland—Improvements in obtaining motive power, and in evaporating liquids.

Recorded August 1.

1863. Joseph Roberts, Old Jewry—A continuous or rachet spanner.

Recorded August 4.

1889. Rudolph Bodmer, Thavies Inn, Holborn—Improvements in machinery for converting into down or fibres, capable of being spun, the remnants or cuttings, or other waste pieces of silk or other fabrics.—(Communication from Charles Lewandoski, Paris.)

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 14th July, to 6th August, 1860.

July 14th, 4275 William Calcott, Park Village East, Regent's Park, N.W.—"A reflector of scenic effects."
18th, 4276 Henry English, Redditch—"Crotchet needle."
19th, 4277 Thomas Edward Whiting, 14 Owen's Row, Goswell Road, E.C.—"The regulating pencil."
21st, 4278 George Sturrock, Brompton, Kent—"Portable combined sitting rifle-rest and chair."
23rd, 4279 John William Mott, Lea Bridge Road, Clapton, N.E.—"A pouch, or purse, for containing tobacco and other articles."
27th, 4280 Thomas Fletcher, Long Eaton, Derbyshire, and Joseph Fletcher, Ison Green, near Nottingham—"Scissors."
Aug. 1st, 4281 Victor Isaac Hazelton, The Duke's Arms, Upper Marsh, Lambeth, S.—"Syringe ring."
6th, 4282 Morris and Yeoman, Astwood Bank, near Redditch—"Needle case."

GAS HOLDER,

ERECTED AT THE SOUTH LAMBETH DISTILLERY,

FOR F. HODGES ESQ^E, BY

J.T.B. PORTER & C^O. *GAS ENGINEERS*, LINCOLN.

W. Johnson Patent Offices Lincoln's Inn Fields & Glasgow

Mackay & Kirkwood Glasgow

GAS HOLDER.

By Messrs. T. & B. Porter & Co., *Gas Engineers. Lincoln.*

(*Illustrated by Plate* 262.)

Since the great industrial congress of 1851 the application of the fine arts to purposes of utility has heen fostered and greatly extended in this country. It has been affirmed "that utility should never be sacrificed to taste," neither should one be ignored for the sake of the other, but he united and blended together in pleasing harmony. Our manufacturers appear now to aim at the development of this principle; and there is a growing disposition to adopt the beautiful or ornate design for ordinary utilitarian purposes, which tends at once to refine the taste and cultivate a love of the beautiful, and approximate to the forms of nature, whose commonest production is one of utility and beauty in their purest combination.

The illustration which we present, in plate 262, is an example of these remarks in the application of a chaste design to the ordinary purpose of a gasholder, tank, and pillars, probably the first instance in this country where such has been fully carried out. The credit due to the production of this work rests with Messrs. J. T. B. Porter & Co., Lincoln, gas engineers, who are the manufacturers of the "National Coal-gas Apparatus," which is considered the most perfect and economical gas apparatus for private residences that has heen brought out. This apparatus has been extensively used in this and other countries during the last three years, and has carried off all the prizes offered for small gas apparatus for farm steadings, and other domestic purposes. The work which we are now discussing has heen executed for Mr. F. Hodges, of Church Street, Lambeth, the eminent distiller, whose establishment throughout combines the practical and the ornamental in a remarkable manner. Passing from the banks of the Thames, and close by the palace of Lambeth, you come at once upon the Distillery, and enter the porter's lodge, around which are suspended instruments of "terror to evil-doers." You are then inside a building which causes you to pause and consider whether you are in a medieval court or a palatial cellar; everything appears cleanly and quaint, and "order, neatness, and regularity characterize the whole."

The several departments of the distillery are all distinguished by a similar attention to the various minutiæ, and some idea of the extent of the business may be formed when we state, that one department contains sixty vats, some of which hold 4000 gallons each. Not far from the vat room, is the building containing the stills, the arrangement and constructive details of which are all of the highest order. The powerful pumps which are worked hy the engine are capable of forcing up to the higher floors of the buildings, 200,000 gallons of water per diem; the quantity raised being indicated hy an ingenious tell tale. The casks are also raised and lowered from the different floors by means of hydrostatic pressure. The stables and harness room are perfect models of systematic order, and the establishment has long been famed for the possession of some of the finest dray horses in the kingdom. These stalwart animals are lodged and tended in a manner, that many a poor fellow-creature might envy. Ascending to the upper part of one portion of the building we come to the bath rooms, for the use of those employed on the premises, and these are furnished with every requisite, that even luxury could demand. On the roof of the principal building of the range is a small lake of about an acre in extent, and which serves as a reservoir in case of fire. Here to, the ornamental has heen pleasingly blended with the useful, for in its centre is built a graceful fountain, which spouts forth its jets with considerable power. Near the engine-house is another fountain, which supplies hot water for various uses, washing casks, cleaning the premises, supplying the bath rooms, and is liberally used also in the stables.

In 1852 the range of Mr. Hodges' workshops were destroyed hy fire, and since that period the proprietor has organized a complete fire brigade. The fire engine is a very powerful one, by Shand and Mason, and the whole of the accessories are as perfect as skill and the utmost attention can make them. The distillery brigade has in very many instances rendered the most important assistance at fires in the neighbourhood. Indeed, Mr. Hodges is deserving of all praise for the very laudable and philanthropic manner in which he carries out a favourite idea. He has formed an observatory on the upper part of the building, from which the position and distance of a fire may be readily ascertained. This room is also furnished with numerous philosophical instruments, and a daily meteorological record is kept.

In erecting a new gasholder on his premises, Mr. Hodges entrusted the work to the firm already noticed, and they have executed their task with ability and taste.

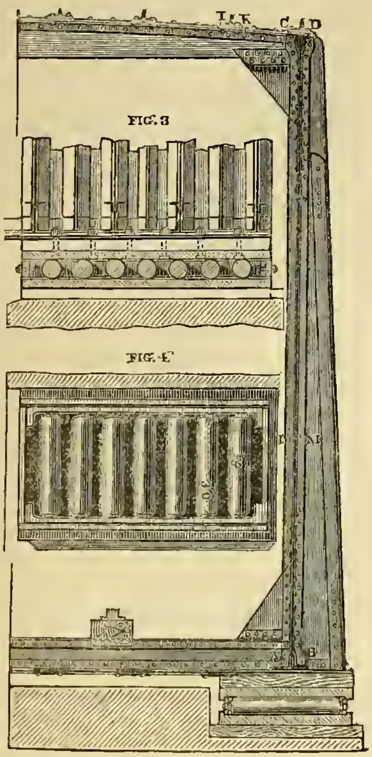
The tank, pillars, and girders are of the decorated character. The tank is formed of cast-iron plates securely holted together, its edge being terminated by a battlemented cornice, and at either side with spouts and heads of the same character to carry off the waste water, thus preventing any overflow on the tank sides during rain or otherwise. The tank is 10 feet in depth, and sunk into the ground to the depth of 4 feet. It rests upon a bed of concrete 1 foot in thickness. Outside the tank rise three piers of solid masonry, or cementedbrick work, capped with stone bases for the pillars, and chamfered in pattern to harmonize with the general design. On these piers, the pillars, three in number, rest. They are square in plan, and formed of open tracery in four stages, with bold, ornamental bases and quarter-foiled caps, on each side of which are embedded shields bearing the insignia of the proprietor. The cornice is embattled and terminates with a coned spirelet and large handsome *fleur delis*. The connecting beams or girders are formed of open trefoils capped by an ornamental cresting of flowers and cusps. The angles are filled with traceried brackets. Guide rods are fixed inside each pillar on which work the guide rollers of the self-adjusting gasholder, which is, of course, of the usual cylindrical form, made as perfect as its shape would permit. The whole of the details, down to the smallest minutiæ, has been carefully studied, forming a *tout ensemble* of the most perfect character, and quite the reverse of the many abortions which receive the epithet of "engineering gothic."

It will, we think, be admitted by all who look at our illustrative plate, that in the design, as carried out hy Messrs. Porter, a very great improvement has heen effected in combining and blending harmoniously the graceful tracery of the gothic style, and adapting it to the exigencies of the work to be accomplished. This example is a striking instance that an object, however inharmonious in its general outline, may, with due attention, be made not only tolerable but pleasing to the eye. We trust that the labours of Messrs. Porter will not he cast away, but that gas engineers, having similar structures to erect, will resolve to go forward in the path of improvement which is here indicated.

THE VICTORIA BRIDGE, MONTREAL.

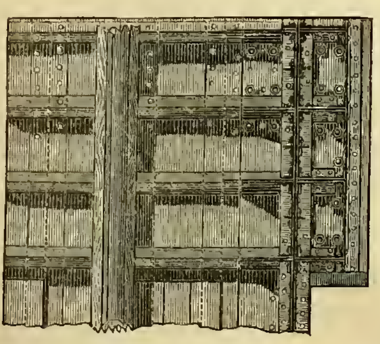
The crowning ceremony which completed this great work was performed with immense *eclat* on the 25th of August last, hy the Prince of Wales laying the last stone, and driving the last rivet in the gigantic structure. The work, which has occupied five years of unceasing industry, and skill of no ordinary kind, is now completed. But, amidst the bright pageantry which accompanied the final ceremony, there was one face missing; that of the great engineer who projected the work. Robert Stephenson is no longer with us; we deplore his loss for many many reasons, but we deeply regret also that he was not spared to witness the completion of his great undertaking. Had he been there, he would have heen, next to the Prince, the cynosure of all eyes. And he might have well looked round with pardonable pride upon the circumstances attending the final ceremony. The last stone laid, and the last rivet driven by the hands of the heir of his Sovereign, might well have given rise in his mind to a feeling of high gratification. But Stephenson's mental vision would have traversed far heyond these external circumstances, and have dwelt upon the result of the undertaking and its ultimate effect upon commerce, civilisation, and the promotion of peace and good will among the nations on both sides of the St. Lawrence. A writer who was present at the ceremony, says:—The Menai Bridge is a noble structure, yet only the germ of the great idea here developed to its fullest. Brunel's great bridge at Saltash is remarkable for the wonderful skill with which it overcomes obstacles which were, in fact, almost created that the engineer might have the pleasure and merit of vanquishing them. Rochling's suspension-bridge, over the rapids of Niagara—the most ingenious, and, perhaps even the most beautiful bridge of its kind in the world, is only designed for a special and peculiar gorge, and, apart from this, no fair comparison can be drawn between the Niagara and the Victoria, when the former is only 800 feet long and the latter more than 9,000. To appreciate the Victoria Bridge, to do justice to its grand conception, and what seems the almost superhuman energy and skill necessary to carry out the idea in all its present grand perfection, one must see it. One must not only see it, for a merely indefinite length gives no real idea of the immensity of the undertaking. The visitor should look at the St. Lawrence in winter, when millions of tons of floating ice come rushing down it, and in summer when even at its lowest ebb the current flows like a sluice, at the rate of eight miles an hour. He should remember that the whole of its bed is a mere quicksand, strewed over the bottom with gigantic boulders, weighing 25 and 30 tons, that the depth of water is nowhere less than 25 feet, and that the stream at this point is two miles wide. When any one takes the trouble to think quietly over the nature of these obstacles, and then looks up at the lofty rib of iron, which stretches high in air from shore to shore, he must be more or less than human if he does not regard it as the grandest and most successful engineering work which the world has yet seen.

Fig. 1.



It is by no means an imposing or even tolerably well-looking structure. Its height from the water and its immense length gives it more the appearance of a gigantic girder than a bridge. Viewed at sunset, when its dull tints are brightened into red, and with Montreal as a background, with all its tin roofs and steeples glistening like silver in the sun, it looks well enough, though never much more than an iron footpath to the picturesque city beyond; and few can believe at the first glance that it is really more than five times longer and bigger than the longest bridge ever yet constructed.

Fig. 2.



Its total length is very nearly two miles (9,500 feet); its height from the water little over 100 feet. It is composed of 25 tubes joined in lengths of two tubes, each about 270 feet, with a centre one of 330 at the highest part above the river. In weight of iron it is very little over a ton per foot in length (the lightest bridge of its kind ever made with the same strength), and the contraction and expansion of the whole make a difference in its length between summer and winter of more than 10 feet, which is, of course, properly allowed for in its construction. The piers, which are 24 in number, and contain some 3,000,000 cubic feet of masonry, were formed by forcing down coffer dams of wood in the exact places where the foundations were to be laid, then driving rows of piles round these, and filling in between the two with wads of clay, forced down till they were water-tight. The water inside the cofferdam was then pumped out by steam pumps, and the work of clearing out the gravel and mud, and laying the masonry down on the very rock, commenced.

It may give some idea of the varied and overwhelming nature of the obstacles contended against when we state that some piers were destroyed by ice and quicksands as often as six or seven times year after year, and that on the average of the whole 24 piers the works of each one were actually destroyed thrice. Only the genius of Stephenson and Ross, and only the unconquerable nerve and readiness of Mr. Hodges to whom the entire work of the building was intrusted, could have overcome such obstacles, and persevered in the face of such apparently hopeless reverses. At last the piers got above water, and were faced towards the set of the current with a long massive wedge of granite masonry, strong and sharp enough to divide even the icefields of the St. Lawrence. Gradually, and only working in the summer, they were built to the required height, and then the labour of constructing the tubes commenced. Fig. 1 of the accompanying illustrations is a half section of one of the tubes, and fig. 2, a corresponding plan; they are of a rectangular figure like the Britannia tubes, but they are not cellular at the top and bottom as in their case. The Victoria tubes are, however, the largest which have been constructed without cells, but, unlike the Britannia, the bridge is built for only a single line of rails.

Fig. 6. Fig. 7.

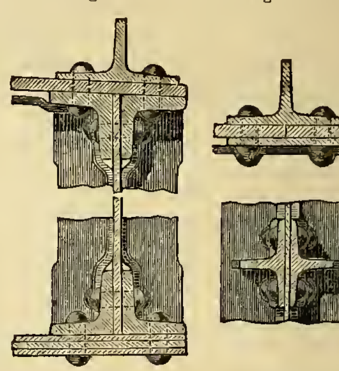


Fig. 5. Fig. 8.

The tubes are 18 feet 6 inches high at the abutments, and they gradually increase to 22 feet in the centre of the the bridge. The width of each tube is 16 feet, and the space between the rails, 5 feet 6 inches, which is the standard gauge of Canada.

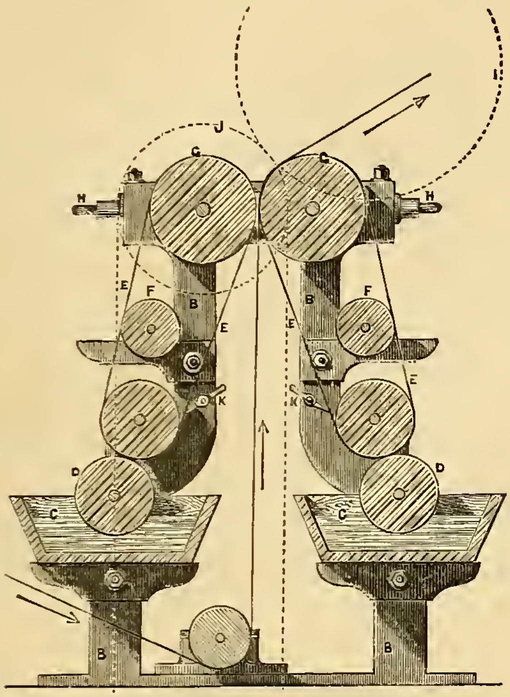
The contraction and expansion of the superstructure has been provided for by an arrangement of cast iron rollers placed between plates of the same metal. Fig. 3 represents a vertical section of this arrangement, and fig. 4 a plan of the rollers. The upper plates are bolted to the under sides of the tubes, and the lower ones are imbedded in the stone. The tubes are fixed at one end to the piers and at the other they rest upon this system of rollers. A variation of eight degrees in the temperature makes a difference of 1-10th of an inch in the length of the 242 feet tubes. The working of this arrangement of rollers has been found in every respect satisfactory. Fig. 5 is an enlarged sectional view taken through the lower part of the tube in the line, A B. Fig 6 is a corresponding section of the upper part of the tube taken in the line, C D. Fig. 7 is a section on the line, I K, showing the arrangement of the external T angle-iron over the abutting edges of the roof plates, and fig. 8 is a plan on the line, L M. The weight of the centre, 330 feet tube, is 686 tons and a half, and of the other tubes little short of 300 tons each. We heartily rejoice that this huge work has been brought to a successful close, and trust that it may long continue to unite the two nations on either side of the mighty St. Lawrence in friendly commercial emulation.

THE MANUFACTURE OF ENAMELLED PAPER.

Of late years the demand for tinted paper having a beautifully glazed surface has greatly increased. This demand has arisen in consequence of the extensive consumption of ornamental papers in the preparation of fancy boxes, and wrappers for enclosing various articles of utility and ornament. These tinted papers are to a great extent elaborately embossed with rich and costly designs, or printed in gold in various beautiful designs. Very many of our readers have probably no idea of the amount of capital embarked in this branch of business, or of the expense incurred in preparing and producing new designs. The demand then for these tinted papers has naturally called forth improvements in the machinery for colouring and glazing the surfaces, with a view of producing them in the best and cheapest manner. We are indebted to Mr. Henry Bruce, the spirited proprietor of the Kinleith Paper Mills, near Edinburgh, for the latest improvements in this branch of mechanical art. This gentleman has obtained letters patent for the mode of producing paper tinted upon one or both sides, which operation, as well as the glazing, is effected as the paper leaves the drying cylinders of the machine.

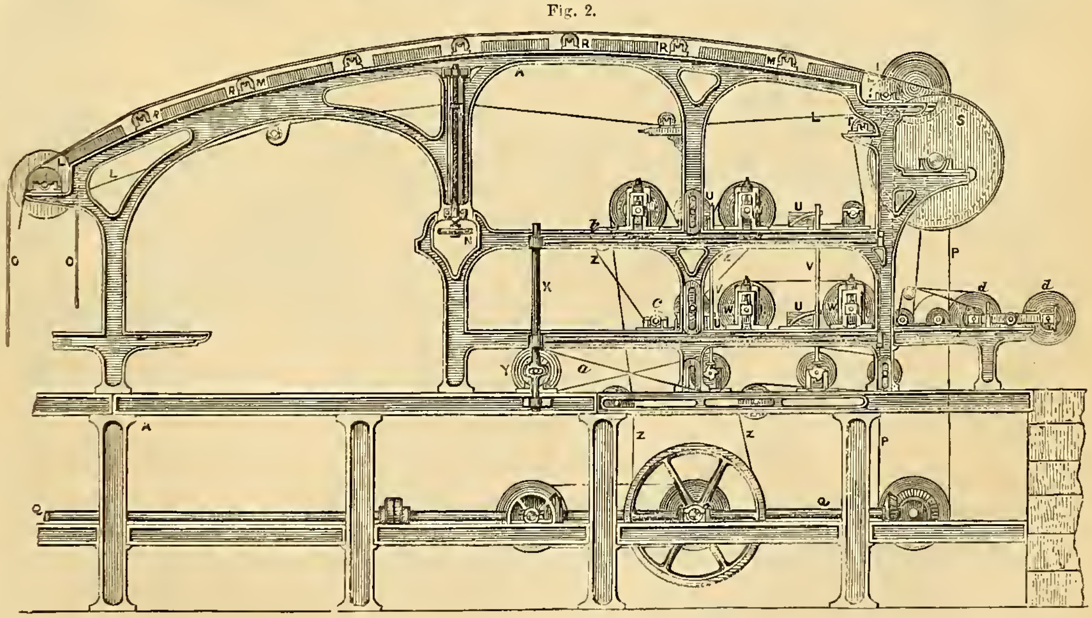
The framing, A, of the machinery consists of open cast-iron side standards, united by transverse rails at the portion shown in the accompanying illustration; the framing sweeps upwards, forming a curved or polygonal figure, where the drying and glazing processes are effected. The web of paper, as it issues from the rolls of the dry calender, is carried under a guide roll, and subjected to the colouring or staining process, which forms the first part of the patentee's improvements. The apparatus for colouring the paper is shown in sectional elevation in fig. 1 of the accompanying engravings; it consists of the parallel end standards, B, which are supported on the main framing, A. At the lower

Fig. 1.



part of the standards are projecting brackets, which support the two colour troughs, C, the ends of which carry the bearings of the colour rolls, D. Above each of the rolls, D, is arranged a corresponding roll, round which is passed an endless felt or cloth, E, the spindles of the upper rolls, are carried in bearings fitted in the projecting parts of the standards, B. Above the upper rolls, are arranged a pair of secondary or tensional rolls, F; the endless cloths, E, are carried above these and round the upper rolls, G, the bearings of which are fitted in laterally extending slots formed by the recesses which are cast in the upper part of the standards, B, and by bolting a top plate thereto. The brasses, in which the spindles of the rolls, G, rotate, are furnished with an adjusting screw, H, which projects out beyond the end of the standards, B, so that the rolls can be screwed up to each other with more or less force. The colouring matter or material for coating the paper, is placed in the troughs, C, and is taken up by the lower rolls, D, which are driven by their frictional contact with the endless felts, E, which derive their motion from the wheels, I and J; the colour thus imparted or deposited on the felt is distributed in an even film by the action of the "doctors" or scrapers, K, which are arranged in proximity to the upper rolls. The felts, E, as they pass round with the rolls, G, impart or deposit the colouring matter upon the paper, which is travelling upwards between the rolls. With this arrangement of the colouring rolls the web of paper may be tinted with different colours upon each side, if such a diversity of colours is required. From the colouring rolls, G, the web of paper is carried to the arrangement of steam drying boxes delineated, in fig. 2 of the accompanying engravings. The paper passes on to an endless felt or cloth, L, which is carried round an end roll, and thence over the rolls, M, which are arranged on the upper part of the framing, A, and over and under lower rolls, and round an end roll arranged at the upper extremity of the framing. The centre one of the lower rolls is arranged in connection with an adjustable screw motion, which is actuated by the hand-wheel, N, so that the endless felt, L, may be adjusted to any required degree of tension. The rolls round which the felt, L, is strained, are put in motion by means of the belts, O and P, the latter being driven by a wheel on the shaft, Q, which gives motion to another wheel on a secondary shaft, carrying the driving pulley; a corresponding arrangement is fitted at the other end of the shaft, Q, to drive the belt, O. In its passage over the rolls, the colouring matter or coating material on the paper is dried by passing the web over the steam boxes, R, which are arranged on the upper part of the framing between the rolls. In this modification of the patentee's invention, the steam boxes, R, are flattened chambers of cast-iron, extending across the framing, A, each pair being connected by a copper steam pipe. The boxes are heated by means of a current of steam or heated air, which is caused to circulate through the series; the steam is conveyed to the first box of the series by a pipe connected with the boiler or air heating furnace, and is carried away by a pipe, which is connected with the last box of the series. If preferred, cylinders may be used in place of the flattened boxes, which cylinders may be heated by similar means to those used for the boxes. From the roll at the extremity of the drying apparatus, the paper is carried round the drying cylinder, S, the ends of which are carried in bearings that are supported on brackets projecting outwards from the framing, A. From the cylinder, S, the paper passes round the roll, T, and thence downwards and beneath another roll, to the glazing apparatus. This operation is effected by causing powdered French chalk to be distributed over the surface of the paper, and rubbed over by means of rolls or brushes. The powdered chalk is contained in the boxes, U, the bottoms of which are perforated, a rapid shaking motion being imparted to them so as to cause the glazing material to fall through the holes. The boxes and the glazing rolls or brushes are arranged to glaze both sides of the paper, if required, the upper series acting upon one side and the lower ones upon the other side of the paper. Beneath the boxes, two horizontal shafts are fitted in pedestal bearings, which are bolted to the longitudinal rails of the framing; the shafts have fast to each extremity a ratchet, which gives motion

Fig. 2.



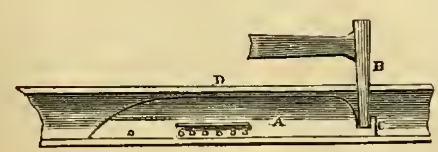
to a vertical rod, V. Slots are made in these rods through each of which is passed a laterally projecting pin on the arm of each box. The boxes, U, are fitted with end journals, which work in the bearings on the longitudinal rails of the framing, so that the boxes rock easily to and fro. The rapid vibratory motion imparted to the rods, V, when the ratchets are put in motion, is communicated to the boxes through the arms, and causes the powdered chalk or glazing material to be dusted over the surface of the paper as it passes beneath. The glazing material is rubbed over the paper in order to produce a smooth and glossy surface, by means of rolls or brushes arranged parallel to and near the boxes, U. The glazing rolls, W, may be made of wood and covered with cloth, or they may be made to form a circular brush. The shafts of the rolls, W, are carried in adjustable bearings, which are fitted on the side rails of the framing, and by means of adjusting screws they are caused to press with any desired degree of force upon the wooden bed or platform over which the paper passes. In addition to the rotatory motion imparted to the rolls, W, a lateral motion is also given to them. The shafts of the rolls project out beyond the framing, A; one extremity of each shaft has a journal formed on it, which is partly encircled by the forked extremity of a lever. These levers are fast to the horizontal rods arranged parallel to the rail of the framing, one extremity of each of these rods is carried in a bearing secured to the framing, A, whilst the other end passes through and is fast to the boss of a horizontal lever, the free end of which enters a slot in the vertical bar, X. A transverse slot is formed at the lower part of the bar, X, in which a pin projecting from the face of the disc, Y, works; this disc is fast to the end of a horizontal shaft. The actuating pin is set in an oblong plate which slides to and fro in a dovetail groove formed on the face of the disc, Y, so that the pin may be set more or less from the centre of the disc, according to the amount of lateral motion it is desired to give to the glazing rolls. When the horizontal shaft carrying the disc, Y, is put in motion, the bar, X, rises and falls with a regular intermittent motion, which causes the horizontal rods to rotate partially, and thus impart to the levers and shafts a transverse movement to and fro, at right angles to the direction in which the web of paper is moving. The dusting boxes and glazing rolls are primarily put in motion by a pair of bevel wheels on the shaft, Q, a belt from a cone pulley on the shaft of these wheels gives motion to another cone pulley on the horizontal shaft carrying the disc, Y. On this shaft is a second cone pulley, a crossed belt, *a*, from which drives the cone pulley on the nearest shaft carrying the ratchet; this shaft carries also a pulley, the belt of which gives motion to the second, and in this manner both the tiers of dusting boxes, U, are actuated, and the lateral motion of the glazing rolls is obtained. The paper as it passes from under the upper pair of glazing rolls is carried over the guide roll, *b*, and downwards to the guide roll, *c*, under which it passes, the other side of the web being now exposed to the dusting and glazing mechanism on the lower rail. From the second glazing roll of this series the paper passes round another guide roll, and is finally wound upon the reel, *d*. By means of these several arrangements continuous lengths of paper may be coloured and glazed or enamelled with great rapidity and in a superior manner.

HISTORY OF THE SEWING MACHINE.

ARTICLE XXXI.

On the 17th of January, 1859, W. E. Newton, obtained a patent for improvements in sewing machines, the main object of which is the reduction of the friction in working the shuttle of a sewing machine. For this purpose the shuttle driver is applied to one part only of the shuttle's length in place of at its front and back extremities. The shuttle, which is formed of thin metal, is pointed at one end and rounded off at the other end, where a projecting lip is secured in such a manner as to form a socket between the lip and the end of the shuttle, into which socket the nose of the reciprocating driver is received, as will be clearly understood on referring to the annexed illustration, Fig. 200, which shows the shuttle, A, in its race, and the end of the driver, B, engaged in the socket formed by the lip, C. This driver has a hammer-shaped head, which is notched at its lower side to fit loosely over the edge of the shuttle race, D, but not to be actually in contact therewith. Its stock terminates in a pivot, which drops into a tubular socket in the front end of an arm, to which a vibratory motion is imparted from the main shaft of the sewing machine for the purpose of impelling the driver to and fro. This pivot is perpendicular to the table of the machine, and the depth of the socket and the length of the pivot are such, that any tendency in the driver to sink out of its proper position is effectually prevented, whilst it is at the same time sustained so that no pressure upon the edge of the shuttle race takes place. The driver is guided during its to-and-fro motion, by the opposite sides of a race, between which its hammer-shaped head plays freely.

Fig. 200.



A patent was granted to G. F. Bradbury and Joseph J. King, on the 27th of January, 1859, for a peculiar guide to be employed in applying bindings to the edge of fabrics. This guide consists of an internal block surrounded by an external case, a space being left between them through which the binding passes until it arrives at the end of the block where it is drawn at or near a right angle to the space through a curved groove at the end or side of the block. This curved groove is of the desired form and size of the exterior of the binding, the interior being free to cover the article to be bound, and held close until the stitch is made. This guide is fastened to a plate provided with vertical pins in which the binding is interlaced to obtain the necessary tension. The internal block swivels on a pin, so that its position can be altered to suit different widths of binding, and when adjusted it is fastened by a screw. The plate to which the guide is fixed is secured to the machine by screws and slotted holes so as to admit of its free adjustment thereon. The binding is doubled accurately in the middle by this guide, hence both sides are equal, and the certainty of both sides being caught by the stitches is ensured. Or the guide may be so arranged as to double the binding unequally, and thereby produce a broader binding on one side of the fabric than on the other, still ensuring the certainty of the stitch catching on both sides. As no part of the guide intrudes itself between the material to be bound and the binding, the two are brought as close together as possible, and any curve or angle may be turned without the binding getting loose from the guide.

John Raywood obtained a patent on the 31st of January, 1859, for a single thread sewing machine, wherein the thread is held, in making the chain and stitch, by a looper worked by the needle slide. The looper having entered the loop of the thread, secures it in a countersink until the return of the needle to form the next stitch. In connection with this machine the inventor also proposes to introduce a slide, working through a cylinder containing a spring, to assist the return of the needle, the slide working through a stuffing box at each end of the cylinder.

A patent was granted to Richard A. Brooman, on the 1st of February, 1859, for an invention communicated to him from J. P. Pirsson, of New York. This invention has reference, firstly, to an improved method of

Fig. 201.

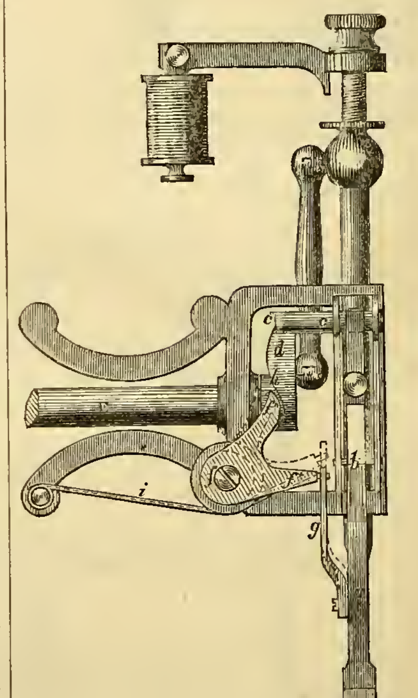
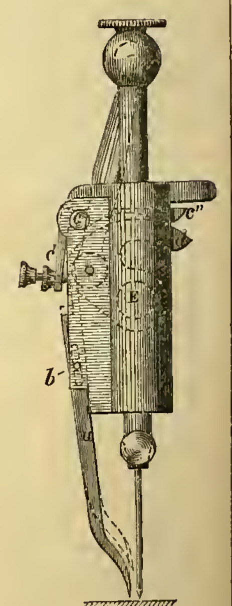


Fig. 202.



constructing the feeding parts, whereby the length of stitch can be regulated with the greatest readiness, and the feed be given with certainty; and, secondly, to an improved method of forming the stitch itself, whereby the loop is drawn with certainty into the part of the looper or shuttle; the improvements being alike applicable to a double or a single thread machine. The improvement in the feeding parts is shown at figs. 201 and 202. *a*, is a bar curved at the lower end towards the needle, in the manner represented in fig. 202. This bar has a vibratory motion upon a pin, *b*, near its upper end, and its lower end is drawn out into the form of a blunt chisel, as shown. The pin, *b*, passes through a vertical slot in this bar, in order that it may have a reciprocating motion. The vibratory motion to withdraw the foot of the bar away from the needle, and thereby give the feed, is effected by means of a cranked lever, *c*, one arm of which, c^1, rests against the upper end of the bar, *a*, the other arm, c^{11}, being acted on by a cam, *d*, on the shaft, E; thus, when c^{11}, is thrown up by the cam, the upper end of the bar, *a*, will be pressed inward by the arm, c^1, and the lower end withdrawn, so soon as the cam gets clear of the arm, c^{11}, that arm drops, and the return motion of the bar, *a*, is caused by a spiral spring within the casing, which acts so as to throw the upper end of *a* outwards. The upward reciprocating motion is given by a bell crank, *f*, one arm, f^1, of which takes into the head of a link piece, *g*, screwed upon the side of the bar, *a;* the other arm, f^{11}, is acted upon by a projection, *h*, upon the back of the driving crank for the needle bar, as shown in fig. 201, and when this projection gets clear of the arm, f^{11}, the bar, *a*, is at liberty to drop. This alone would not be sufficient to secure the amount of pressure necessary for giving a feed, and this is obtained by a spring, *i*, coiled upon the shaft, F, of the crank, and operating so as to force the arm, f^1, down. It will be seen that the lower end of the bar, *a*, is not placed vertically beneath its pin, *b*, but is curved towards the needle, as shown in fig. 202. When the cam, *d*, is not lifting the arm, c^{11}, the foot of the bar, *a*, will rest upon the cloth at the side of the needle, being pressed down upon it by the spring, *i*, and when the cam comes into action, the lower end of *a*, would, if permitted, describe an arc, which, from the starting point, would necessarily be below the surface of the cloth, and this insures a due pressure to give the feed, although in consequence of the foot being unable actually to go below the surface, the bar, *a*, must rise a little against the force of the spring, *i*, as the said foot is carried outwards in giving the feed. The cams, *d* and *h*, are so timed to each other, and to the motions of the needle, that so soon as the extent of feed has been given, the arm, f^1, shall be thrown up, raising thereby the bar, *a*. The arm, c^{11}, is then clear of its cam, *d*, and consequently the lower end of *a* is free to return towards the needle. The cam, *h*, now passes by f^{11}, permitting the bar, *a*, to come down again upon the cloth to serve as a stripper for the needle whilst that is rising out of the cloth, and to be again moved out for another feed, the distance to which it will be so moved out being governed by a set screw in c^1, as shown. From this it is obvious, that whatever be the thickness of the cloth at the place where the foot comes upon it, the operation of feeding will be effected with the same certainty.

We shall describe the improvements in the parts for forming the stitch as in connection with a machine which forms a lock stitch by the interlocking of two threads on the reverse side of the cloth. In figs. 203 and 204, the looping hook, which carries the second thread to be interlocked

Fig. 203

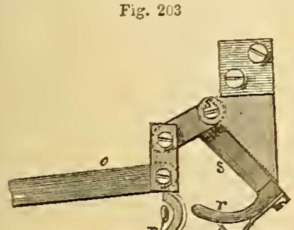
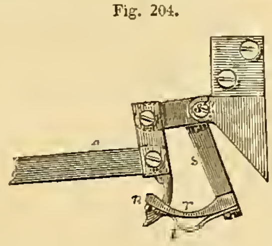


Fig. 204.



with the needle thread, is shown at *n*, and is moved by the arm, *o*, operated from the main driving shaft. It is well known that the loop from the needle thread does not always bow out with certainty, so that the looper must inevitably enter, and many devices, such as grippers, pincers, &c., have been resorted to in order to ensure that the loop shall bow out on the proper side of the needle, as well as be so spread open that the looper must pass into it. The inventor accomplishes this by employing a curved arm, *r*, which is placed either just above or below the path of the looper, but so as not to be struck by it. This curved arm, *r*, is set on an arm, *s*, which is centred at s^1. The curve of the outside face of the arm, *r*, from its point to about midway of its length, is a true segment of a circle struck from s^1, but for the remainder, it falls back of that line, and the curved arm is so set that the part near the point shall rub lightly upon the needle as it vibrates on its centre, s^1. On the face of *r* is a finger spring, *t*, curved in the manner shown, and made to bear upon *r*, at about one-third of the distance from its point. In fig. 203, the looper is about to be withdrawn, and the needle and curved arm, *r*, to advance for the new stitch; as the needle comes down, the face of the end of *r*, strikes it, and the arm, *r*, advances, so as to bring the point of contact of its finger spring up to the needle, which will force the spring open, as *r* continues to advance, thus bringing the needle within the open part between *r* and *t*. The needle now begins to retreat, throwing out a loop, and as the arm, *r*, also retreats, its face rubbing against the needle, renders it certain that the loop will be formed in one direction only, whilst the finger spring holds the loop out so that the looper shall enter. If a shuttle be employed, the arm, *r*, may be placed between it and the under side of the table.

Another part of this invention consists in the application of a needle stripper and a cloth holder combined in one instrument, and made to operate in connection with the feed foot and needle in such a manner as to be made to rest upon the cloth with different degrees of pressure at different times, so that whilst the feeding foot is lifted from off the cloth to take a new feed, and the needle is being withdrawn, the pressure shall be greatest, and shall be least at the moment of the feed being given. Thus, although the cloth at the time of feeding is allowed to be moved with the least resistance, it is still pressed sufficiently, to keep it smooth in the path of the needle and feed. Figs. 205 and 206 illustrate this arrangement. A, represents the head or end of the bracket overhanging the table; the needle stock is seen at B, and works in a guide hole in A, as usual. This hole is enlarged in the under part sufficiently to allow of the introduction of the tubular piece to which the presser foot is attached, and which piece also surrounds the needle stock, and forms the guide hole in continuation with that bored at the top, so as to fit the stock. The presser foot is attached by a rod to the tube, C, as seen at D. This foot is made to press hard upon the table by a spiral spring above the tube, C, as shown at *e*. The tube, C, has a slot, c^1, cut throughout its whole length, for the purpose of allowing a pin, *i*, on the needle stock to play. This pin is so placed, that when the stock is at its upstroke, it will strike the coiled spring, *e*, and compress it, and thus taking its pressure at that moment off from the presser foot, as shown in fig. 206, but without raising the foot from the table, upon which it will then rest by its own weight only. This is the position of the parts when the feed of cloth is to take place, and the feeding foot, G, is seen to be also on the bed or table in position for gripping the cloth before giving the feed. The cloth not being then held down by any greater pressure than the mere weight of D resting upon it, is easily drawn along, whilst at the same time it is kept smooth, and also prevented from shifting its position before the needle enters. The shape of the cams which drive the needle arm and the feeding foot is such as to cause the needle to be held up until the feed is given, hence there is no necessity for any greater pressure upon the cloth than the weight of the presser foot, but when the needle has entered, and is about to be withdrawn, the pressure of the

Fig. 205.

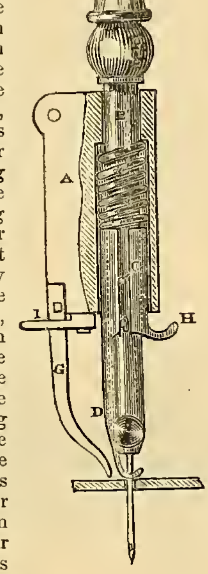
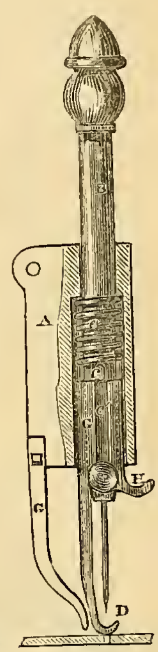


Fig. 206.



spring comes into play for the double purpose of a stripper and to keep the cloth in place, whilst the feed foot is lifted for returning to give the next feed. This pressure is applied by the spring being allowed to come upon the head of C, as the needle stock, B, descends. The operation of these parts is as follows:—First turn the driving wheel until the needle stock, B, is raised to its full height; this lifts the spring from the presser, D, which can then be raised by the finger piece, H, so that the foot will stand clear of the table; it will remain up by the friction of the tube part in the bracket head. The feeding foot must also be held up; this is done by turning the arm, I, round, so as to come under a pin on G, as seen in fig. 205. The cloth can then be run under these pieces, and be placed in proper position for sewing. The thread being in the eye of the needle, and all other parts in order as usual, the sewing will go on by setting the machine in motion. The needle as it is forced down by B, enters the cloth through a split in the foot, D, so that the latter embraces it on both sides, and close to the hole in the table, the spring, *e*, forcing the foot down hard upon the cloth as the pin, c^1, retreats from under it. Turning the arm, I, will release the feed foot, which is driven down by the force of its spring pressure upon the cloth, and so soon as the needle stock has risen to such a height as to again compress the spring, *e*, the feed foot gives its lateral movement, and takes the cloth along the distance for spacing the stitch. This order of movements goes on continuously, effecting the sewing as usual. When the cloth is to be removed, the presser and the feed foot are to be raised, as already described, and the cloth is thereby released.

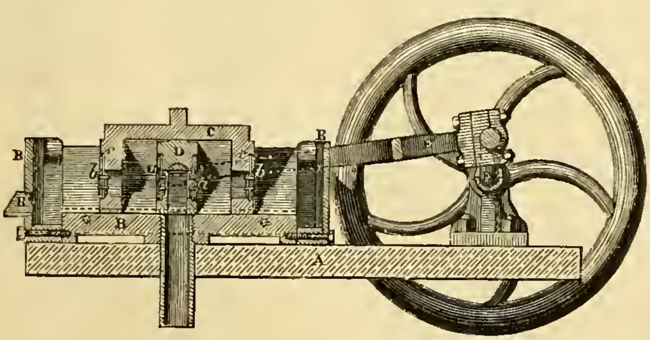
HAWKSLEY'S NEW PUMP.

This ingenious contrivance was briefly mentioned in our notice of the Society of Arts' Exhibition, where a specimen was on view. We can now present our readers with a fuller description, illustrated by engravings. The inventor employs a metal trough, by preference of a V form, and over this a second trough of similar form is inverted thus $\overset{\wedge}{\vee}$ and this trough has ends, which fit closely to the sides of the lower trough, so that the two troughs enclose a space between them. This space is divided into two parts by a partition attached to the lower trough, and fitting closely to the inclined sides of the upper trough; this partition is made double or hollow, and the space so formed is in communication with the suction pipe. Through each side of the partition passages are formed, connecting the two parts of the space enclosed by the troughs with the space within the partition; these passages are furnished with valves opening outwards; passages fitted with valves opening outwards are also formed at the two extremities of the upper trough. This trough, by a crank or otherwise, is caused to slide to and fro on the lower trough, so that its two ends come alternately close up to the partition between them. Each time that the ends of the upper trough move towards this partition, the valve in the end opens to allow the fluid between the two to escape, and during the return motion this valve closes, and the valve on the partition opens in order to allow fluid from the suction pipe to enter and fill the space left between the end of the upper trough and the partition. In this manner the operation continues, and a continuous stream is maintained up the suction pipe and out through the valves at the ends of the upper trough. The troughs may, of course, be varied in form, for example, they may be made semicircular, or a flat bed may be employed with a three-sided trough fitting over it. Pumps constructed according to this invention are applicable for exhausting and forcing air and gases in addition to raising liquids.

The invention will be better understood by reference to the figures which we now proceed to describe.

Fig. 1 is a longitudinal section, and fig. 2 is a transverse section of a pump constructed according to this invention. A, is the bed of the pump; B, is a V form trough, bolted to it; C, is a trough inverted over the trough, B; this trough, C, is furnished with ends, C, which fit closely to

Fig. 1.



the sides of the trough, B; D, is a partition, fixed to the trough, B, at or near the centre thereof; this partition is hollow, and the space within it is in communication with the suction pipe; A, are valves fitted to apertures in the sides of this partition: they are capable of opening outwards. B, are also valves capable of opening outwards, and are fitted to apertures in the ends of the trough, C. The trough, C, is connected by the forked rod, E, with a crank on the shaft, F, which is carried in suitable bearings bolted to the bed, A. The shaft, F, is furnished with a fly-wheel, which may either be turned by the handle or by steam power, as may be preferred. As the crank shaft revolves, the ends of the trough, C, are alternately moved up to the partition, D, and as they again recede from it a vacuum is produced between the end and the partition; one of the valves, A, then opens to allow water to escape from the suction pipe into this vacuum. When the motion is reversed, the valve, *a*, closes, and one of the valves, *b*, opens to allow the water to escape. G, are pipes connecting the two ends of the trough, B; and H, is a spout by which the water escapes from the pump in a continuous and nearly uniform stream, as one or other of the valves, *b*, is always open and discharging water. A similar pump may, if it be desired, be employed for drawing and forcing air or gases.

Fig. 2.

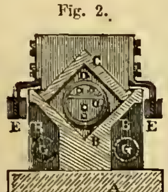
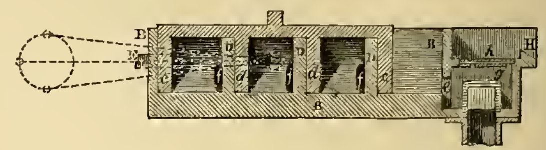


Fig. 3 is a longitudinal section, and figs. 4 and 5 are transverse sections of a pump constructed on the same principle as that shown at figs. 1 and 2, but differing from it in some particulars, the trough, B, is furnished with several partitions, D, in place of one only; this change also renders it necessary to make some other modifications. In these figures, B is the stationary trough, and C, the moveable trough, inverted over the trough, B, as before. The trough, C, in addition to its ends, *c*,

Fig. 3.



is also furnished with intermediate partitions, *d*, fitting closely to the sides of the trough, B, one of the said partitions being placed between each pair of partitions, D, of the trough, B. In place of making the partitions, D, hollow, as in the former case, they are made solid, and passages, *e*, are formed along each side of the trough, B. The apertures for the passage of the water or other fluid to and from the spaces between the troughs are formed in the sides of the trough, B, as is shown at *f*. The passages, *e*, communicate with chambers, *g*, which have openings through them both at the top and bottom; these openings are fitted with valves opening upwards, as is shown; the openings at the bottom of the chambers, *f*, connect these chambers with the upper part of the suction pipe.

Fig. 4.

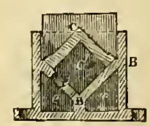
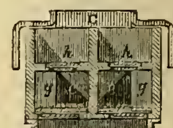


Fig. 5.



The action of the apparatus is as follows:—The trough, C, receives a to and fro motion from a crank and connecting rod as before, or in other convenient manner, so as to cause each of the partitions, D, on the trough, C, to traverse in the space between the partitions, D, on either side of it. As the partitions, *d* and D separate, the spaces left between them are immediately filled with water or fluid rising up the suction pipe into one of the chambers, *g*, and passing along one of the passages, *e*. As the partitions, *d*, approach the partitions, D, the water or fluid between them is expelled through one of the passages, *f*, into one of the chambers, *g*, from whence it escapes by the valve at the top, and is then led away by a suitable spout or passage. It will be seen that the two motions above described, viz., the partitions, *d*, approaching and receding from the partitions, D, take place at the same time, each of the partitions, *d*, approaching one of the partitions, D, as it recedes from another; thus a continuous flow of water or fluid through the apparatus is maintained.

THE BRIDGE AT WARSAW OVER THE VISTULA.

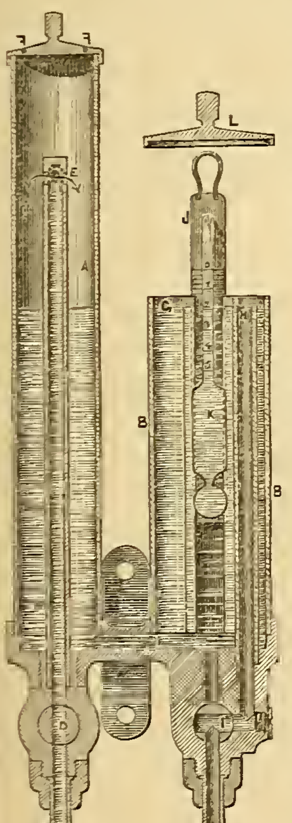
The administration of the kingdom of Poland has just confided to the well-known contractors, Messers. Ernest, Gouin, & Co., the construction of the first fixed bridge erected over the Vistula, at Warsaw. This great river is, at this part, not less than 1650 feet in width. It flows over a deep bed of shifting sand, which necessitates the sinking of the foundations to a great depth. It is further necessary, on account of the great quantity of floating ice during the break up, that the span be as large as possible, in order that little impediment may be offered to the floating masses of ice. The erection of such a bridge would have been considered impossible a few years ago, but thanks to the rapid strides made in the science of engineering, this magnificent undertaking is about to be carried out. Each of the five piers of this bridge will rest upon two cast-iron tubes, of about eighteen feet diameter, and tubes of ten feet diameter sunk about sixty feet below low water level, and are flush at their upper ends therewith. These cylinders or tubes are first cleaned out, and then filled with concrete and rubble work, and being covered with strong planking at the top, form the foundations upon which the piers, which are to consist of Silesian granite, are to be built. The entire bridge will thus contain six arches, of a span each of more than 260 feet. The upper structure will consist of two wrought-iron lattice girders, of nearly 30 feet in height, which support at their lower edges the transverse boarding upon which the flooring of the bridge rests. This flooring will consist of wooden pavement, on the principle adopted with much success for many years in one of the most frequented streets of Warsaw. The carriage way between the two girders will be about thirty-six feet in width, and the foot ways will be constructed outside the girders of a width of ten feet each. The bridge will be built of sufficient strength to carry over ultimately a railway, connecting the general system of railways of Eastern Europe with that of Russia. About 1400 tons of cast-iron, and 4200 tons of wrought-iron, will be consumed in its construction, which is expected to be accomplished in 1862.

LONG'S SALINOMETER CASE.

The committee appointed by the Franklin Institute of Pennsylvania, to report on R. H. Long's marine salinometer case, have issued a document, of which the following is an abstract:—

The ordinary salinometer case, consists simply of a tube communicating with the boiler, and containing the hydrometer—the communication with the boiler being made by means of a pipe which passes from the bottom of the case to below the lowest water-level of the boiler, and provided with a stop-cock, which, when turned, permits the pressure of steam in the boiler to force the water up in the case, and float the hydrometer. But the ebullition in the case, produced by the escape of the steam under a reduced pressure, throws a great deal of hot water out of the instrument, and subjects the observer to the danger of being scalded, and at the same time causes such violent oscillations as to risk the safety of the hydrometer, and prevent its being read until the stop-cock is closed, when very frequently there will not be found enough water in the instrument to float the hydrometer. The annoyances and tediousness of the instrument as ordinarily constructed, therefore, offer strong inducements to the persons charged with the care of the engine, to neglect the duty of reading it. The improvement of Mr. Long consists in adding to the ordinary salinometer case another tube connected with it at the bottom. This supply-tube is connected with the boiler by means of a pipe, which passes from below the water-line of the boiler, through the bottom, and along the axis of the supply tube to a point near its top, where it opens into the supply-tube by means of a number of vertical slits The main tube, in which the hydrometer floats, is not connected with the boiler, but has a waste-pipe by which any escape of water may be carried off; and proper supports for a thermometer.

Now when, by turning the stop-cock, the water is forced from the boiler into the supply tube, it is thrown, not upwards, but against the side of the tube, owing to the mode of its escape. The steam which accompanies it, is separated and escapes through openings in the cover, and the water falling to the bottom passes through the tube of communication and rises to the same level in the salinometer tube, in which, the hydrometer floats tranquilly, and may therefore be read speedily and accurately. By means of the waste-pipe, a current may be kept passing through the instrument, which is thus always in action, and may be read by the engineer at a glance, as he passes it in the performance of his other duties.



The committee believe the modification thus proposed, to be a simple and effective mode of inducing a more general and punctual use of this valuable gauge, which ought not to be neglected on any boilers using salt water; and they therefore commend it to the notice of all engaged in the manufacture and management of such boilers.

The salinometer is shown in section in the accompanying engraving. The improvement consists in attaching the cylinder, A, to the cylinder, B, and having a communication, C, as a means of safety to the hydrometer, by which perfect accuracy in testing the density of water, and insuring the engineer against danger from scalding is obtained. The cylinder or other shaped vessel, A, is connected with the boiler by the pipe and stop-cock, D, the pipe being closed at the top and having openings, E, on the side near the upper extremity. The water coming from the boiler and passing the stop-cock, D, makes its exit through the openings, E: at this point the steam is liberated from the water and escapes through the openings, F. The water falls into the cylinder, A, passes through the opening, C, and rises to the water level, G, in both cylinders; H, is an overflow pipe to carry off the surplus water, and to keep up a sufficient current to maintain the water to be tested, at the required temperature. By turning the stop-cock, I, both cylinders can be discharged. J, is a thermometer fitting in a slide. K, is the hydrometer. L, is the cover for closing the case when not in use. I, is a bracket for securing the instrument to the boiler bulkhead, or other suitable place. This instrument affords a ready means of drawing water from a steam boiler under any pressure and temperature, without ebullition in the cylinder, B, or oscillation to the hydrometer.

BAROMETERS FOR LIFE-BOAT STATIONS.

Public attention has frequently been called to the invaluable use of a barometer for indicating a coming storm. It not unfrequently happens that a notice of a gale is given by a barometer two or three days before it actually takes place. It seems plain that with such powers placed providentially in our hands the calamities now endured by our fishermen and coasters might in many instances be avoided. A good barometer in a public situation would warn them in time what to expect, and they could thus be frequently able to avoid the terrible consequences of storms, so often at present proving fatal to them.

Rear-Admiral Fitz-Roy, F.R.S., has compiled so thoroughly practical a manual for the use of a barometer, that seafaring men or fishermen may soon become perfectly familiar with the indications of the instrument. Some time since, as Chief of the Meteorological Department of the Government, he obtained the sanction of the Board of Trade to supply some forty of our poorer fishing villages with barometers, some of which have been of great service to the fishermen.

It is, however, evident that something more is absolutely required, in order to make barometers generally available for our fishing and seafaring population; it is therefore satisfactory to find that this important subject has been taken up practically by the National Life-boat Institution.

Admiral Fitz-Roy, who is a member of its committee, gives the undertaking his cordial and valuable co-operation. The Admiral's own manual, as well as large placards containing extracts from it, will be extensively circulated on the coast, fully explaining the working of the barometer.

It is proposed to fix such instruments wherever found useful and practicable, on conspicuous parts of the Society's life-boat houses which are situated on most parts of the coasts of the United Kingdom.

To carry out effectually this plan, the Institution has, fortunately, the machinery at hand, for to each of its life-boats is attached a permanent coxswain, who receives a small annual salary for his superintendence of the working part of the life-boat establishment. It is proposed to instruct such of these men as are found capable, in the indications of the barometer, so that they will act as so many storm-warners in the town or village in which they reside.

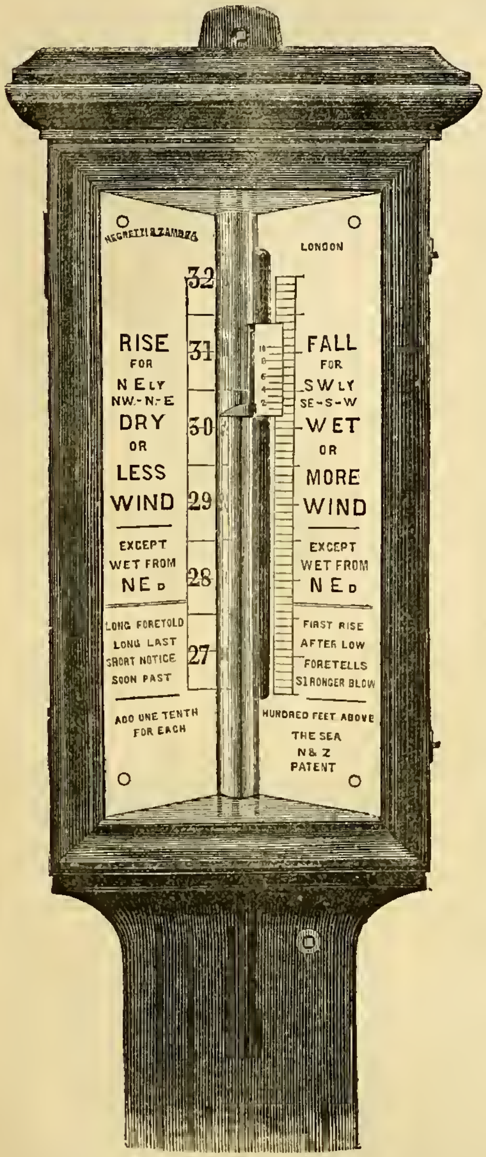
It will be readily conceived what beneficial results may accrue to life and property among our hardy sea-coast population from this important step. It is a lamentable fact that at the present day the masters of our smaller coasting and fishing craft hardly ever think of consulting a barometer, if indeed they have opportunity to do so.

It is estimated that a good barometer cannot be fixed at a life-boat house under £6, so that it will require a considerable sum to carry out effectually the plan of the National Life-boat Institution.

A benevolent gentleman has presented to the Institution £50, to be applied specially to the purchase of barometers for its life-boat stations; and we cannot doubt that the public will readily make up what may be further required.

The making of the barometers has been intrusted to Messrs. Negretti and Zambra, who have supplied the before-named 40 instruments to the Board of Trade, for various fishing stations on the northern coast, and also a number to the British Meteorological Society, for the coast of Northumberland. The object of the National Life-boat Institution will be to obtain a good instrument, and one that will not easily get out of order in travelling, or require renovating at frequent intervals; in short, a barometer that, having been once set up at a life-boat station, will be a permanent instrument of instruction, and one that will not entail any future expense to the Society. In order to meet these requirements, the makers have, therefore, introduced the following changes in the regular instruments, which, we think, may fairly come under the head of important improvements. The brass or ivory scales that barometers are generally furnished with are here replaced by a substantial plate of porcelain, on which the degrees and figures are prominently engraved, and permanently blackened in, so that, as far as the divisions and figures are concerned, there will be no danger of their becoming faded or obliterated. This is a very important improvement, especially for an instrument that has of necessity to be placed in an exposed position, where the mariner may be able to consult it at any time, even in the middle of the night, should he wish to do so.

The mercurial tube of the barometer is of large diameter, so as to render the mercury easily visible, and show the slightest variation; and is so constructed that the liability of air entering it, is, we may say, entirely obviated; for it is a well-known fact that, if a small particle of air by any means finds its way *up* the tube of a barometer, let the quantity be ever so minute, the indications of the instrument are erroneous, and no longer to be relied upon. To prevent these accidents, a trap is laid at the bottom of the tube, near the part called the cistern, so that if any air should find its way into the tube, it cannot possibly pass the trap, but is there detained, and the instrument is in no way deteriorated or injured by its presence. These tubes are, moreover, "boiled." The operation of boiling a barometer tube consists in filling the tube with mercury, and then causing the mercury to boil by placing the full tube over a charcoal fire; it is an operation attended with considerable risk to the tube and operator, and for this reason is seldom carried into practice, and in the majority of barometers made it is altogether neglected. The size of the mercurial column averages four-tenths of an inch, so that, altogether, instruments of the greatest efficiency will be obtained. A great change has also been effected in marking the old system of scales with fair, change, rain, &c., words which in reality have often a tendency to mislead, and to throw discredit on barometrical indications. The plan to be adopted in the life-boat barometer is shown in the accompanying engraving. This has been arranged systematically.



It is well known that the labours of the National Life-boat Institution, as corollaries to its own immediate sphere of action, in diffusing useful information on the treatment of the apparently drowned, and on the management of boats in heavy surfs and broken water, have already been productive of public benefit, not only on the coasts of the British Isles, but also over many parts of the globe. It may, also, be fairly anticipated that similar beneficial results will ensue from the establishment of these barometers at its life-boat stations.

We subjoin a synopsis of Admiral Fitz-Roy's instructions on the use of barometers. These instructions will also be printed on large placards for use on the coast, wherever the barometers of the National Life-boat Institution are placed, and elsewhere:—

The barometer should be set regularly by a duly-authorized person, about sunrise, noon, and sunset.

The words on *old* scales of barometers should not be so much regarded for weather indications as the *rising* or *falling* of the mercury; for if it stand at *changeable*, and then rise towards *fair*, it presages a change of wind or weather, though not so great as if the mercury had risen higher; and, on the contrary, if the mercury stand above *fair* and then fall, it presages a change, though not to so great a degree as if it had stood lower: besides which, the direction and force of wind are not therein noticed.

It is not from the point at which the mercury may stand that we are alone to form a judgment of the state of the weather, but from its *rising* or *falling*; and from the movements of immediately *preceding* days as well as hours—keeping in mind effects of change of *direction*, and dryness, or moisture, as well as alteration of force or strength of wind.

It should always be remembered that the state of the air *foretells coming* weather, rather than shows the weather that is *present*—(an invaluable fact too often overlooked)—that the longer the time between the signs and the change foretold by them, the longer such altered weather will last; and, on the contrary, the less the time between the warning and the change, the shorter will be the continuance of such foretold weather.

If the barometer has been about its ordinary height, say near thirty inches at the sea-level, and is steady or rising, while the thermometer falls, and dampness becomes less,—north-westerly, northerly, or north-easterly wind, or less wind, less rain or snow may be expected.

On the contrary, if a fall takes place with a rising thermometer and increased dampness, wind and rain may be expected from the southeastward, southward, or south-westward. A fall with low thermometer foretells snow.

When the barometer is rather below its ordinary height, say down to near twenty-nine inches and a half (at sea-level), a rise foretells less wind, or a change in its direction towards the northward—or less wet; but when it has been very low, about twenty-nine inches, the first rising usually precedes or indicates strong wind—at times heavy squalls—from the north-westward, northward, or north-eastward; *after* which violence a gradually-rising glass foretells improving weather, if the thermometer falls; but if the warmth continue, probably the wind will back (shift against the sun's course), and more southerly or south-westerly wind will follow, especially if the barometer's rise is sudden.

The most dangerous shifts of wind, or the *heaviest* northerly gales, happen *soon* after the barometer *first* rises from a very low point; or if the wind veers *gradually*, at some time afterwards.

Indications of approaching changes of weather, and the direction and force of winds, are shown less by the height of the barometer than by its falling or rising. Nevertheless, a height of more than thirty (30·0) inches (at the level of the sea) is indicative of fine weather and *moderate* winds; except from east or north, *occasionally*.

A rapid rise of the barometer indicates unsettled weather; a slow movement, the contrary; as, likewise, a *steady* barometer, which, when continued, and with dryness, foretells very fine weather.

A rapid and considerable fall is a sign of stormy weather, and rain or snow. Alternate rising and sinking indicates unsettled and threatening weather.

The greatest depressions of the barometer are with gales from S.E., S., or S.W.; the greatest elevations, with wind from N.W., N., or N.E., or with calm.

A sudden fall of the barometer, with a westerly wind, is sometimes followed by a violent storm from N.W., or N., or N.E.

If wind sets in from the E. or or S.E., and the gale veers by the south, the barometer will continue falling until the wind is near a marked change, when a lull *may* occur; after which the gale will soon be renewed, perhaps suddenly and violently, and the veering of the wind towards the N.W., N., or N.E., will be indicated by a rising of the barometer, with a fall of the thermometer.

After very warm and calm weather, a storm or squall, with rain, may follow; likewise at any time when the atmosphere is *heated* much above the *usual* temperature of the season.

Not only the barometer and thermometer, but appearances of the sky and clouds should be vigilantly watched.

Signs of Weather.—Whether clear or cloudy, a rosy sky at sunset presages fine weather; a red sky in the morning bad weather or much wind, perhaps rain; a gray sky in the morning, fine weather; a high dawn, wind; a low dawn, fair weather.*

Soft-looking or delicate clouds foretell fine weather, with moderate or light breezes; hard-edged, oily-looking clouds, wind. A dark, gloomy, blue sky is windy; but a light, bright blue sky indicates fine weather. Generally the *softer* the clouds look, the less wind (but perhaps more rain) may be expected; and the harder, more "greasy"' rolled, tufted, or ragged, the stronger the coming wind will prove. Also, a bright yellow sky at sunset presages wind; a pale yellow, wet; and thus, by the prevalence of red, yellow, or gray tints, the coming weather may be foretold, if aided by instruments, almost exactly. Small, inky-looking clouds foretell rain; light scud clouds driving across heavy masses show wind and rain; but if alone, may indicate wind only.

High upper clouds crossing the sun, moon, or stars in a direction different from that of the lower clouds, or the wind then felt below, foretell a change of wind.

After fine clear weather, the first signs in the sky of a coming change are usually like streaks, curls, wisps, or mottled patches of white distant clouds, which increase, and are followed by an overcasting of

* A high dawn is the break of day seen above clouds, instead of the horizon.

murky vapour that grows into cloudiness. This appearance, more or less oily or watery, as wind or rain will prevail, is an infallible sign.

Light, delicate, quiet tints or colours, with soft, undefined forms of clouds, indicate or accompany fine weather; but gaudy or unusual hues, with hard, definitely-outlined clouds foretell rain, and probably strong wind.

When sea-birds fly out early and far to seaward, moderate wind and fair weather may be expected. When they hang about the land, or over it, sometimes flying inland, expect a strong wind, with stormy weather.

As many creatures besides birds are affected by the approach of rain or wind, such indications should not be slighted by an observer who wishes to foresee weather.

Remarkable clearness of atmosphere near the horizon; distant objects, such as hills, unusually visible; or raised (by refraction), and what is called "a good *hearing* day," may be mentioned among signs of wind, if not wet, to be expected.

More than usual twinkling of the stars, indistinctness or apparent multiplication of the moon's horns, halos, "wind dogs" (fragments or pieces of rainbows, sometimes called "wind galls,"), seen on detached clouds, and the rainbow, are more or less significant of increasing wind, if not approaching rain, with or without wind.

Lastly, the dryness or dampness of the air, and its temperature (for the season) should *always* be considered, *with other* indications of change, or continuance of wind and weather.

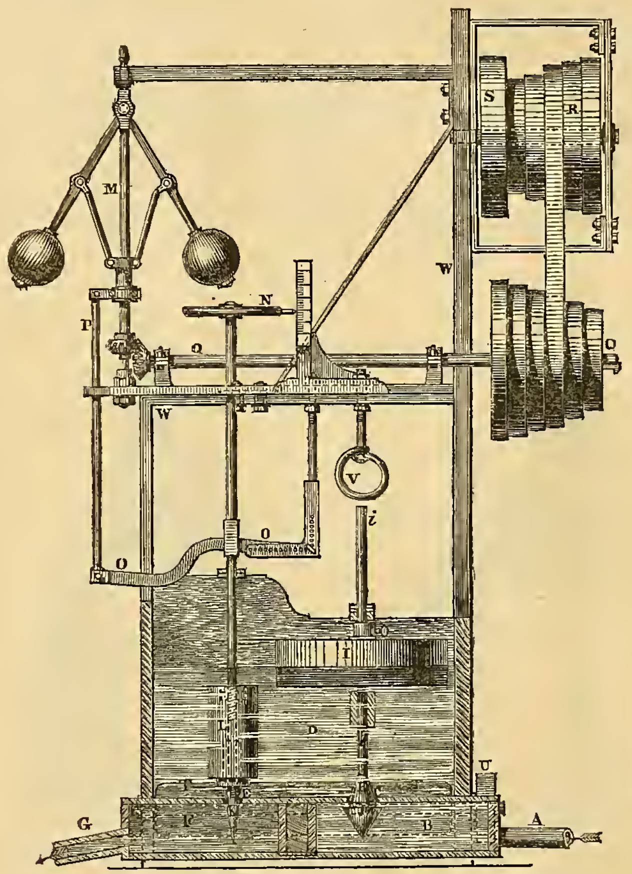
EXTENSION OF LITERATURE IN FRANCE.

The extension of literature in France during the past fifteen years from 1843, will be readily observed by the return given below. From the years 1843 to 1858 inclusive, the press of France has issued the following number of works:—In 1843, 6009; in 1844, 6577; in 1845, 6521; in 1846, 5196; in 1847, 5530; in 1848, 7234; in 1849, 7378; in 1850, 7208; in 1851, 7350; in 1852, 8261; in 1853, 8133; in 1854, 8011; in 1855, 8253; in 1856, 12,027; in 1857, 12,019; and in 1858, 13,331. These annual sums present a total of 129,038 works, being an average of 8602 per annum for the fifteen years. The approximate number of copies issued in this interval of time, may be arrived at by receiving as an average three volumes to each work, and an edition of 1200 copies to each, when we arrive at a result of 464,536,800 volumes for the fifteen years, or an average each year of 30,969,120 volumes.

PULP REGULATOR FOR THE MANUFACTURE OF PAPER.

A very useful and efficient contrivance for regulating the flow of pulp, on to the paper making machine, has been introduced by Messrs. Tidcombe, of Watford Iron Works. In order to obtain paper of uniform thickness throughout, it is necessary that the stream of pulp which is allowed to flow on to the wire cloth, should be very regular and uniform in quantity.

By this apparatus a continuous delivery is obtained independent of the variation of the surface in the large cistern containing the mass of pulp, as well as of the variations in the speed of the machine. The regulator being put in motion by the paper machine, it establishes a constantly uniform surface of pulp, and at the same time supplies the machine with the exact quantity of pulp required, whilst it follows the variations of the speed, so as to cause the paper produced to be of a uniform texture. The regulator float being part of the machine, the use of taps or valves are dispensed with as well as with the employment of an operative to tend the arrival of the pulp, the regulator float working and stopping with the machine with unerring regularity. A pipe which communicates with the large cistern or reservoir of pulp, conveys the contents to a small box or cistern, where the delivery is regulated as it passes to the machine by a conical plug agitated by the float, motion being given to the apparatus by the paper machine. The conical plug is held by a screw, so as to be fixed at the required part of its cone to give passage to the quantity of pulp necessary to make the paper of the required strength. By means of a pipe, part of which is shown at A, the pulp is conveyed from the large vat or reservoir to the small box or cistern, B, which forms part of the improved apparatus, and communicates by means of the conical aperture, C, with the larger cistern, D, in which the pulp is maintained nearly at a constant and uniform level. From the cistern, D, the pulp is allowed to pass more or less freely, according to the speed of the paper machine, through the conical aperture, E, in the cistern, F, from whence it passes out by the passage, G, to the paper machine. In the conical aperture, C, is placed a cone, H, which is connected by the rod, *i*, working in guides, to the float, I. This float is supported by the pulp, and acts on the cone, H, so as to allow as much pulp to enter the cistern, D, as passes from it. The cone, H, is furnished with a rim, J, so as to cover the whole and prevent the passage of pulp during a stoppage of the machine. In the conical aperture, E, is placed a cone, K, attached to a vessel, L, of such specific gravity as to allow perfect freedom of action of the parts connected with it. The cone, K, by means of the regulator or governor, M, rests and falls according to the speed of the machine, and allows more or less pulp to escape from the cistern, D, thus relatively influencing the action of the float, I. The cone, K, is connected by an adjusting screw and nut to a rod, having at the top a wheel or handle, N, so as to be able to raise and depress the cone by hand, and thereby regulates the passage of the pulp for the different textures and thicknesses of the paper to be manufactured. The wheel, N, has a finger placed near a gauge or scale, so as to determine at once the desired position of the cone, K, which latter, in order to be regulated according to the speed of the machine, is attached to the lever, O, working at one end on an adjustable fulcrum, and connected at the other by the rod, P, to an arm or gland which rises



and falls as the balls of the governor or regulator extend or collapse. Thus the varying supply of pulp required for different kinds or strengths of paper is determined by the position of the handle and gauge; and the uniformity of strength and texture of each kind of paper by the supply of pulp being regular and uniform with the speed of the paper machine, and perfectly independent of the pressure of the pulp in the large vat or reservoir. Motion is communicated to the governor or regulator, M, by means of a bevel wheel on the lower end of its spindle, gearing into another bevel wheel on the end of the horizontal shaft, Q, at the other end of which is a cone pulley, driven by a belt from the cone pulley, R, which is connected to the pulley, S, both fast on a short shaft over-head, which is driven from the paper machine, and at a corresponding speed. At each side of the cistern, D, is placed two agitators or stirrers, T, driven by the pulley, U. Above the rod, *i*, is placed a spring, V, against which the top of the rod strikes lightly, in order to prevent the cone from locking in the aperture or passage. The cistern, D, forms the lower part of the main framing, the upper part, W, being fixed into a frame to carry the working parts of the regulator. Instead of the cones, H and K, cylinders may be employed, having internal cones to allow the passage of the pulp, and the arrangement of the other parts of the apparatus may be otherwise modified to suit the particular requirements of the machinery to which it is to be applied.

RECENT PATENTS.

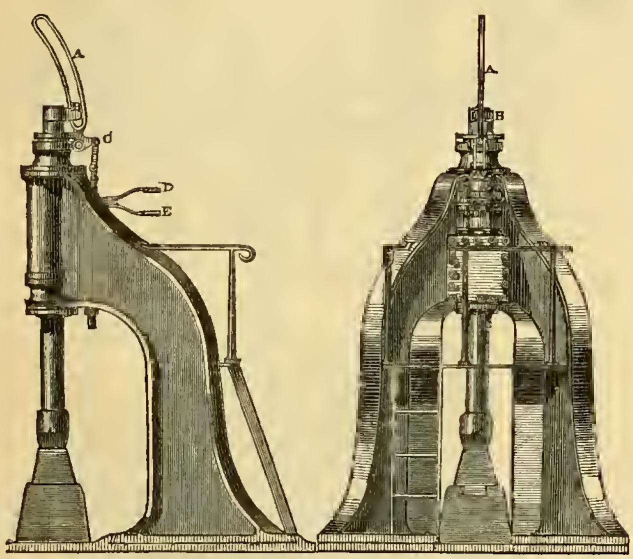
STEAM HAMMERS.

Robert Morrison, *Newcastle—Patent dated December* 16, 1859.

In a former number of the *Journal*, p. 97, vol. vii, 1st series, we reported and illustrated Mr. Morrison's improvements in steam hammers. The patentee's present invention consists in the substitution for the present complicated gearing for working double-acting steam hammers of a spanner or slot link, so arranged that the valve, or valves, do not travel the full stroke unless the hammer is working the extreme distance both up and down, whilst any partial movement of the hammer produces a proportional partial movement of the valve. The respective laps of the top and bottom inlet edges of the valve, or valves, is so altered or regulated that whilst in some cases the whole stroke of the valve will not be sufficient to admit steam either above or below the hammer piston, yet at others the smallest portion of any part of the stroke, whether high or low, will admit steam both above and below the hammer piston. And this constitutes the characteristic feature of the invention, that by an easy and continous sliding action the valve is constantly following the motion of the hammer, whilst the regulation of the lap of the valve, or valves, admits the steam early or late, or during a longer or shorter period of the stroke as may he found desirable.

By respectively modifying the laps of the top and bottom edges and altering the relative strokes of the hammer and valves the steam may

Fig. 1. Fig. 2.



be admitted at any desired portion of the stroke, both above and below the hammer piston and all the combinations of long and short strokes. Heavy or light blows may be made at will without any part of the valve apparatus being subject to blows or jerks.

The requisite adjustment of the lap up or down, as the case may be, is obtained by either using two ordinary valves, and shifting them up and down upon their respective spindles, by screws cut on the spindles working in nuts fixed to the valves, or by using two cylindrical valves shifted in the same way, or by fixing two cylindrical or other valves on the same spindle, but jointed in the middle, so that the screw on the top may be turned irrespective of that on the bottom, or by any combination of such slide or valve, or slides or valves, with their spindle or spindles, whereby the requisite motion or adjustment may be effected.

The patentee uses cylindrical valves with the edges for the admission and egress of the steam disposed in the form of a spiral or screw on the surface. The ports in the cylindrical case being likewise so spirally disposed with a corresponding pitch, that the moving of the valve round in its cylindrical case will cause the edges for the inlet and egress of the steam to advance or recede respectively with those ports on the valve case, and produce the same result as though they were actually lifted and depressed without turning.

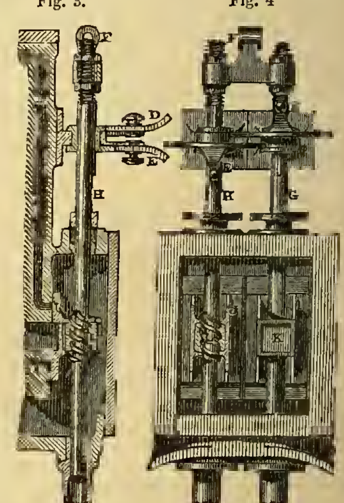
In cases where cylindrical valves may not be used, the patentee adopts valves with bevelled edges, the ports having a corresponding bevel; by moving the valve in this case sideways the same effect is obtained as by the rotatory motion with the cylindrical screw-edged valve.

These improvements also comprehend a mode of admitting steam by hand to the underside of the piston of steam hammers and exhausting the same, leaving a free communication between the top of the piston and the atmosphere, and by simply increasing the length of the stroke of the hand lever, letting the steam both above and below the piston. This is accomplished by having two ports communicating with each side of the piston, the two nearest for the purpose of admitting steam and the two outside ones for its egress, or *vice versa*. The equilibrium piston, or other valves covering these ports, are so arranged, that by a short stroke the steam below the piston may be admitted or exhausted without opening the top steam port or shutting the top exhaust, but by lengthening the stroke by an increased motion of the handle the whole of both the top and bottom ports will be alternately opened and shut as may be required, and this can be done at pleasure for a single or any number of blows or strokes.

Fig. 1 of the accompanying illustrations represents a side elevation of a steam hammer with the improvements fitted thereto. Fig. 2 is a corresponding back view. A, is the spanner or slot link, and B, is a roller fixed on to the top of the hammer bar and working in the slot of the link. This slot link and roller are so arranged that the lever attached to the slide, or slides, is up when the hammer is down, although for certain combinations of ports and slides it may be necessary to reverse this. The curve of the slot link may be made so that for every inch of motion of the hammer-bar any corresponding amount of motion may be given to the valve that may be required, and the motion may be either regular and uniform, or varied,—that is to say, it may either be uniformly the same during all parts of the stroke of the hammer-bar, or it may be made to give a more or less amount of motion at different portions of the stroke of the hammer-bar, if found desirable. D and E are handles for altering the slides for admitting steam above and below the piston.

Figs. 3 and 4 represent front and sectional views of the valves used in the hammer shown in figs. 1 and 2. The crosshead, F, is worked by the slot link, before referred to, and moves with it the two slide spindles, G and H, which actuate the slides, I and J, and are so arranged that they freely turn on their own axes in the nuts, K and L. The slides, I and J, are fitted with nuts on the back, and the screwed spindles, G and H, are so arranged that by moving the spindles round during the whole or any portion of a revolution, the slides may be raised or depressed at will. I, is the valve for admitting steam above, and J, the valve for admitting steam below the piston. The higher the valve, J, is screwed the sooner the steam will pass below the piston; and it may even be screwed so far up that the hammer-bar at the very top of its stroke will not have given the valve a sufficient downward motion to shut it off, and will consequently remain suspended; and the same may be said of the valve, I, it may be so screwed down as either not to open at all, or to open at any part of the stroke of the hammer-bar. The slide spindles have keys let in them, so that the handles, D and E, may give them the requisite rotatory motion on their axes. In another modification the motion of the hammer-bar is regulated by one cylindrical valve, in which case the steam is always admitted alternately above and below the piston, and the part of the stroke where this change is made depends on the relative height of the covering part of the valve compared with the ports. The passages and valve are both portions of screws of equal pitches, and by making the covering part of the valve wider than the openings and turning the valve on its axis these parts will rise and fall relative to the ports. The slide rod is arranged to turn in the crosshead, and the cylindrical case for the slide has its ports likewise spirally disposed and of corresponding pitch to the valve. There is a socket which works round the valve spindle, the top part of this socket being a portion of a screw, and made to fit another part of a screw in the valve, so that by turning this socket the valve can either be jammed fast against the collar on the spindle, or allowed to be loose thereon. This allows the valve to remain stationary during a portion of the stroke of the hammer-bar thereby increasing its stroke by allowing the steam to be acting both above and below during a longer portion of its travel.

Fig. 3. Fig. 4



PUMPS AND BEER ENGINES.

Henry Martin, *Stockton-on-Tees.—Patent dated December* 15, 1859.

The first part of this invention is more particularly applicable to pumps for iron ships or vessels built in several water-tight compartments, and it consists in connecting a box or chamber of any convenient form with the pump barrel, such box or chamber being divided into compartments and provided with a number of valves or valvular openings, one or more to each compartment. These are so disposed that by proper adjustment of the valves, the pump may be made to draw water from any one or more compartments or reservoirs in the ship or other locality, and deliver such water to the sea, or to the deck, or to any one or more compartments or localities, or it may be made to draw water from the sea, and deliver such water into any one or more compartments simultaneously, or on to the deck or rigging, in this latter case acting as a fire engine. Various forms of valves may be used, as, for example, metal disc valves with leather faces, and provided with screw spindles, whereby they may be severally opened or closed in any combination, these are intended to be

Fig. 1.

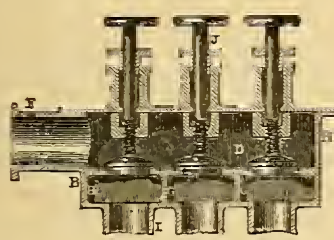
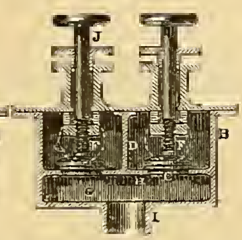


Fig. 2.

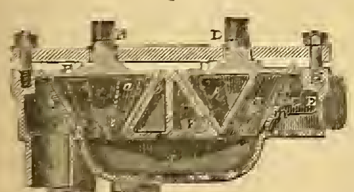


used in dnplicate only. Cylindrical or conically ground plugs or cocks may be used, fitting into correspondingly shaped seats or casings; dished or taper perforated valves fitting into and working air-tight in perforated seats of a corresponding form, so that by turning the valve, any one or more of the perforations in the valve and seat may be made to coincide; the separate perforations in the seat being in communication with separate suction and delivery pipes.

The second part of this invention is more particularly applicable to beer engines or pumps for drawing different kinds of liquors or fluids, and preserving the kind of liquor drawn at one time from being mixed with the kind of liquor drawn before it, and consists in combining with a pump barrel one or more cocks or taps communicating with two or more separate suction pipes. The cocks may be of any shape or form, and have any arrangement of passages through them which will answer the purpose stated; for example, a cock may be used having a passage from each, and such passages being kept from communicating with each other, one passage being in communication with one suction pipe, and the other with a second suction pipe, facility being thus afforded for drawing separately two kinds of liquor at pleasure by simply adjusting the cock or tap, so that one or other of the passages may be put in communication with a hole or port passing into the pump barrel. By using two of these cocks in separate compartments, each compartment communicating with the suction end of the pump, and having two suction pipes leading out of it, four different kinds of liquor may be drawn; by using a three-way cock, three kinds of liquor may be drawn, and by using two of these, six different liquors may be drawn; and by using a three-way and a two-way cock, five liquors may be drawn separately at pleasure, and so on, varying the formation and arrangement of the cocks to snit the particular requirements of the case.

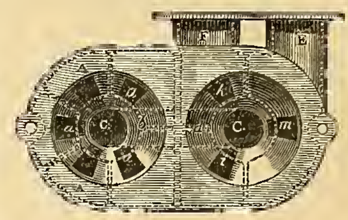
Fig. 1 of the engravings is a section elevation, and fig. 2 a transverse section, at right angles to fig. 1, of one arrangement of lift valves. A, are the top compartments of the valve chamber, B, showing the openings and valves, C, leading to the bottom compartments, H; there is an air-tight division, D, which runs down the centre of the box, B, separating the valves on each side of it. One set of valves being in communication with the suction end of the pump through the branch pipe, E, and the other set in communication with the delivery end of the pump through the branch pipe, F. There are transverse air-tight divisions, G, dividing the bottom part of the chest, B, into three separate compartments, H, each bottom compartment having one or more pipes, I, communicating with the places from or to which the fluid

Fig. 3.



is required to be drawn or conducted. The screw spindles, J, are for opening or closing any one or more of the valves, and when any of the valves on the side, E, are open, and any other valve on the side, F, open, liquid may then be drawn by the pump from the open valve on the side, E, and delivered through the other open valve on the side, F. Figs. 3 and 4 show a sectional elevation and plan of another arrangement, in which the valves are dished or inverted conical valves. These valves are shown separately in figs. 5 and 6, looking on the under sides. By this arrangement water may be drawn from any of the pipes, A, and apertures, *a*, in the valve seat, *b*, and drawn through the communication, *c*, shown in the section and through the port, *e*, of the valve, D, to the branch, E, seen in the plan, which is in communication with the suction end of the pump. The delivery pipe, E, is in communication with the sea or other reservoir through the ports, *h*, *i*, of the valve seat, *d*, and *k*, *l*, of the valve, D.

Fig. 4.



Or, if the valve, D, be turned with its port, *e*, opposite to the port, *h*, in the valve seat, *d*, then the suction end of the pump would be in communication with the sea through the ports, *k*, *l*, in the valve, D, which will be opposite to the ports, *i*, *m*, in the valve seat, *d*. The delivery will then take place through the port, *h*, to the valve, B, fig. 5, and by turning the port in the valve, B, opposite to any of the ports, *a*, in the valve seat, *b*, the water may be sent through that of the pipes, A, to its required destination. The valve, D, fig. 5, is divided by a web separating the port, *e*, from the ports, *k*, *l*, as shown.

Fig. 5.

Fig. 6.

In another modification, the dish valve has a web or partition, by which a perforation on one side of the valve is kept from communication with a perforation on the other side. One end of the valve communicates by a branch with the suction end of the pump, and the other end by a branch with the delivery end of the pump, or *vice versa*. The perforations on one side in the valve seat are in communication with separate suction or delivery pipes. The perforations on the other side of the valve seating being in communication with other suction or delivery pipes, or with the sea, and by turning the valve communication can be established between any suction or delivery pipe and either end of the pump.

In an arrangement of a beer engine, the patentee has shown one of the arrangements for pumping different kinds of liquor. By adjusting any of the holes in the perforated plug of the cock to a hole in the bottom of the pump in close communication with the pump barrel, any of the liquors in the separate suction pipes may be separately drawn and preserved from admixture with the liquor drawn before it, or the liquor in other suction pipes.

TREATING FATTY MATTERS.

J. H. Johnson, *London and Glasgow* (J. E. Lhonore, *Paris*).—*Patent dated October* 8, 1859.

The improvements specified under these letters patent, comprehend a peculiar mode of treating suet whereby a new and superior fatty matter or compound is obtained, applicable as a lubricant, as a preventive against the oxidation of metals, and peculiarly adapted to the manufacture of candles. This substance is obtained by mixing about sixty-seven parts in weight of suet of the finest quality, melted without the aid of acids, with eight parts in weight of the white oxide of zinc. The suet is first melted in a suitable vessel over a slow fire and about twenty parts are poured through a fine silk sieve or strainer into a cast-iron flat-bottomed boiler, previously heated to prevent any cooling of the suet. The eight parts in weight of oxide of zinc are now added and well mixed with the melted suet by stirring with a pestle. This produces a stearate of zinc, which will be shown by the transformation of the suet into a thick milky substance, and by the absence of the oxide on the pestle or stirrer. This operation will generally require about one hour to complete, after which the remainder of the melted suet is added, being strained through a sieve as before, and the whole is well stirred together, so as to mix the stearate of zinc, already formed, intimately with the additional suet, which operation will require about an hour to complete. The produce is a new preparation of suet, which the inventor designates "chemical suet," and which may be packed in barrels for subsequent use; a sieve or strainer being employed through which the prepared material is passed when filling the barrels; for the retail trade the suet may be ladled out of the barrels into earthen pans, so as to form it into small moulds or pots, the whole of the processes and operations being conducted with the greatest cleanliness. As one example of the application of this prepared suet, the patentee refers to the manufacture of candles therefrom. The candles are first moulded in the ordinary manner from suet of the first quality, which has been well strained, and these candles, on being withdrawn from the moulds, are suspended by means of hooks to rods at such distances apart that the candles will not be in actual contact with each other. These candles are now coated or covered externally with the "chemical suet," hereinbefore mentioned, containing about six per cent of oxide of zinc, by dipping them once into such material, which has the effect of imparting to the candle an appearance of the best wax candles, whilst the quality is also greatly improved.

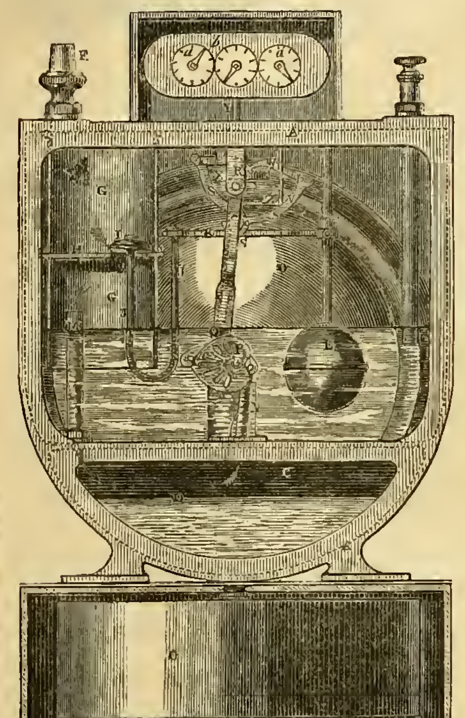
GAS METERS.

MAGNUS MANSON, *Edinburgh.—Patent dated February* 28, 1860.

UNDER this patent Mr. Manson has introduced several important improvements in the arrangements of the wet gas meter, so as to render them accurate indicators of the quantity of gas passed through them, irrespective of the variation of the water level.

Fig. 1 of the accompanying engravings is an elevation of one modification of the patentee's improved compensating gas meters, with an open front, to show the internal arrangement; and fig. 2 is a plan corresponding. The casing, A, is formed, by preference, of cast iron, the whole of the body being in one piece; the only detached portion being the moveable front, B, which is secured by screws to the body part. The meter casing, A, is divided into two compartments by the diaphragm, C, which encloses a portion of the front part of the meter, and forms a waste water-box, D. The surplus water in the box, D, flows off through a tubular opening at E, in the front, D, which opening is closed by a milled headed screw. The gas flows into the meter through the inlet pipe, F, and passes into the compartment or valve chamber, G. This chamber is open at the lower part to the body of the meter, so that the water contained within the meter, rises to an equal height within the chamber. The valve chamber is, by preference formed in two parts, the upper division being secured in a gas-tight manner to the roof of the front part of the casing, A. At the junction of the two parts of the valve chamber, a diaphragm, H, is formed on the lower portion, in which is a circular opening to admit of the passage of the gas to the body of the meter. The flow of gas from the inlet chamber through the opening in the diaphragm, H, is controlled by the valve, I, which is attached to the bent spindle, J. The valve spindle is carried downwards, and bent so as to pass under the edge of the valve chamber, G, and up to the regulating lever, K, to which it is attached. This lever is one of the second order, its forked extremities are centred on pins which project out from small lugs cast on the diaphragm, H.

Fig. 1.



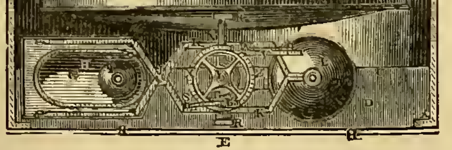


Fig. 2.

The right hand extremity of the lever, K, is connected to the stem of the float, L, the intervening portion of the lever between the stems of the valve and the float forms an open frame or obtuse angled figure. The axle of the measuring drum, O, carries a heart-wheel, P, the periphery of which works against two pins fixed in the forked ends of the oscillating lever, Q. The upper end of this lever is fast to a horizontal rocking spindle, which is carried in the pendent bracket-piece, R, that is fast to the roof of the casing, A The rotatory movement of the heart-wheel, P, imparts an oscillating motion to the lever, Q, which is communicated to the pendent lever, S. This lever is arranged at the back of the lever, Q, and passes down between two laterally projecting pins fixed therein. The lever, S, is fast to a horizontal spindle, T, which is carried in lugs formed on the open or bowed part of the regulating lever, Q. The upper portion of the lever, S, is bent outwards to a curved figure, and has jointed to its extremity a pawl, U. The opposite end of the spindle, T, carries a second lever, V, corresponding to the lever, S, excepting in the prolongation of its lower part, to this lever, V, is jointed the pawl, W. Both these pawls rest on the rim of, and give motion to, the crown wheel, X, which is fast to the vertical spindle, Y. This spindle is carried at the lower extremity in the horizontal part of the bracket, Z, which is screwed to the roof of the casing, A. The spindle, Y, passes through a hole made in the bracket, R, which serves as a collar-bearing for it; the upper part of the spindle has a pinion fitted to it, which gives motion to the indicating train of wheels. This part of the mechanism is arranged in the ordinary and well known manner, and, therefore, does not require particular description. The rotatory motion of the measuring drum carries round the heart-wheel, P, which is fast to its axle, and in the position in which it is delineated in fig. 1, the periphery of the heart-wheel is moving the lever, S, to the left hand side, by its pressure against the corresponding pin of the oscillating lever, Q. This motion of the lever, Q, moves the upper part of the lever, S, over to the right, the pawl, U, which is resting in the teeth of the crown-wheel, X, consequently moves this wheel round to a corresponding extent, and the amount of motion thus imparted to the spindle, Y, is indicated on the dials above. When the apex of the heart-wheel, P, has passed the left hand pin of the lever, Q, the wheel then acts upon the right hand pin which carries the lower part of the lever over to the right side, this motion causes the lever, V, by means of the pawl, W, to move round the wheel, X, in the same direction as when acted upon by the pawl, U. The wheel is thus moved round with a uniform rotatory motion by the alternate action of the pawls, U and W, and in this manner the pawls glide alternately over the teeth of the wheel, without affecting the action of the one in operation, they being arranged in opposite directions, as shown in fig. 2. The arrangement of the levers, S and V, and the parts connected therewith, also provide for the variation of the water level arising from evaporation or other causes. The levers, S and V, being arranged on the oscillating lever, Q, and the pawls, U and W, resting loosely on the wheel, it follows that as this lever descends with the sinking of the float, that the levers, S and V, are practically lengthened, and hence take up a greater number of teeth than when the float is at the full height of the water level. So that with this arrangement, as the water sinks below the true water level, and the upper compartments of the measuring drum consequently contain a larger quantity of gas, the crown-wheel is driven round at an increased speed, or with a smaller number of revolutions of the heart-wheel. In this way the quantity of gas passed through the meter is accurately measured and indicated on the dials, notwithstanding the gradual diminution of the water contained in the meter, this alteration in the water level being compensated for by the mechanical arrangement connected with the float. With a view of regulating the valve with nicety, it is preferred, in some cases, to have the stem of the float made tubular, and to come just up to an orifice in the casing of the meter. The tubular stem is carried down inside the float, and partially divided at about the centre of the float in such a manner, that shot or other matters, passed down the stem, fall through the lateral aperture. Care is taken to make the float lighter than is required in practice, and when the meter is being adjusted small shot are dropped down the stem of the float until it is of the proper weight, the aperture in the casing is then closed up. With these several improvements, the wet gas meter is rendered a far more accurate and reliable instrument than those of the ordinary kind.

MANUFACTURE OF STEEL.

J. H. JOHNSON, *London and Glasgow* (F. A. DUFEY, *Paris*).—*Patent dated January* 28, 1860.

THESE improvements relate to a mode of converting into steel, or for the steeling of wrought or cast-iron, which is effected by submitting articles, manufactured either of wrought or of cast-iron, to what the patentee terms the vaporisation process, viz., to the action of certain vapours produced by the application of heat to mixtures hereafter mentioned, or by the immersion of articles manufactured of wrought or of cast-iron in the bath from which the vapours before mentioned are obtained. These processes offer considerable advantages over those ordinarily employed for effecting the "steeling" or the conversion of objects made of wrought or of cast-iron into steel. The bath which is employed to produce the vaporisation is composed of charcoal dust, grease, and fatty matters of all kinds, animal, vegetable, together with fish oils, saltpetre, horn, or other azotized bodies, prussiate of potash, soot, sea salt, powdered slate, and burnt leather, black lead, and other substances of similar natures; but mixtures of these materials may be modified as required. The mixture which is preferred consists of—

Grease,...	500 parts by weight.
Oil,...	500 ,, ,,
Charcoal,..	350 ,, ,,
Prussiate of Potash,.......................	250 ,, ,,
Horn,..	330 ,, ,,
Saltpetre,..	300 ,, ,,

By subjecting wrought or cast-iron to this vaporisation process its conversion into steel is effected in a very short time, a few minutes will suffice, and the steel obtained is of superior quality, possessing a high degree of hardness, and equal, if not superior, to fine grained cast steel. It is a steel that is admirably adapted for the manufacture of articles of warfare, harness work, and for the several industrial appliances of steel rails, wheels, springs, and all other pieces and parts connected with or belonging to railways which are subjected to great friction, and which are consequently soon destroyed, and require frequent renewal, may be hardened and converted into steel by this process, and so obviate the difficulties and inconveniences attendant on the use of iron. Results may also be obtained similar to the cementing process now in use, and steel of good quality is produced hard, ductile, and pliable, by plunging cast-iron or castings into a bath prepared for the vaporisation process. Two objects or two pieces of metal may be operated upon at the same time by immersing one of such objects in the bath before described, and submitting the other to the action of the vapours resulting from the bath by the action of heat, and their conversion may be effected in a few minutes. In the same manner, and by the same processes, the patentee improves ordinary steel, and imparts to it qualities characteristic of steel of superior quality.

INSULATING TELEGRAPH WIRES.

J. H. Johnson, *London and Glasgow*, (J. M Bachelder, *Massachusetts, U.S.*)—*Patent dated January* 17, 1860.

These improvements relate to the application to, and use in, the insulation of submarine electric telegraph wires, of a new compound substance, offering the advantages of greater flexibility and elasticity, and less liability to be softened by heat; whilst, at the same time, a better insulation is obtained, as the compound employed is a more perfect non-conductor of electricity. According to this invention it is proposed to cover the conducting wires of submarine electric telegraph cables, in any convenient manner, with a compound made of pulverised silex, glass, or other absolute non-conductor of electricity, mixed with India-rubber and sulphur, and subsequently vulcanised. Or, in some cases, pure unvulcanised India-rubber, without sulphur, may be used, mixed with pulverised silex, glass or other non-conductor, in suitable proportions. The improved insulating material or compound, is prepared by first thoroughly grinding or masticating the India rubber, and thus forming a paste or dough, according to the ordinary process of making vulcanised India-rubber, and then adding thereto a quantity of silex, reduced to a fine powder. The ingredients should be thoroughly incorporated and uniformly mixed. The proportions preferred are twenty parts of India-rubber, five parts of sulphur, and seventy-five parts of powdered silex, such parts being ascertained by weight. It is preferred to make the powdered silex by grinding pure quartz in a mill, in the manner commonly practised by manufacturers of porcelain. In place of silex, glass, or other good non-conductor of electricity, may be used for this purpose. The compound, being prepared as above stated, is in readiness for the vulcanising process, which is conducted in the ordinary manner, the degree of heat being such as to allow the resulting substance to be sufficiently flexible when applied to the conducting wire or wires of a telegraph cable. By using the proportions above given of rubber, sulphur, and silex, the specific quantity of the compound obtained is about 1·600; it will not soften at a lower temperature than 300° Fah., and is much more flexible than gutta-percha. This compound, consisting of a large proportion of glass or silicious materials, is a better non-conductor than the gutta-percha of the quality commonly used for this purpose. This compound is to be applied to the conducting wire, either by drawing or forcing it through suitable apertures; by winding the wire with spiral fillets; by passing it through grooved rollers, or in any other convenient manner. In some cases the sulphur and the vulcanising process may be omitted, and this insulating compound may be made simply of pure India-rubber and fine silex, in the proportion of twenty-five parts of India-rubber, and seventy-five parts of silex, which proportion may be varied so as to change the specific gravity of the mass, or give the insulated wire a greater or less degree of flexibility. The admixture of various earths and other materials with the compound of India-rubber and sulphur has been previous effected, the patentee, therefore, disclaims all such mixtures or compounds, confining his improvement strictly to the mixture of an absolute non-conductor of electricity with the rubber and sulphur, or with India-rubber alone, whereby a highly con-conducting substance is obtained, whilst it is at the same time well adapted, in other respects, to the insulation of conducting wires of electric telegraphs.

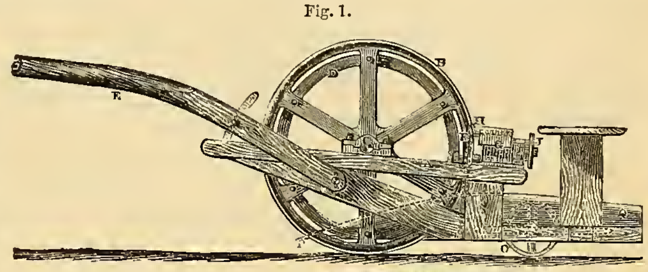
REAPING MACHINES.

E. A. Süwerkrop, *Leith.—Patent dated August* 6, 1859.

The object of these improvements in the reaping machine is the simplification of the driving gear, so as to produce a more effective working action of the machine.

Fig. 1 of the illustrative engravings is a side elevation; fig. 2, a plan; and fig. 3, a transverse vertical section of a reaping and mowing machine, having the improvements applied thereto. A, is a rectangular frame of timber, which is strongly bolted together; in this frame is fitted the cast-iron wheel, B, which is keyed on the iron axle, C; this axle works

Fig. 1.



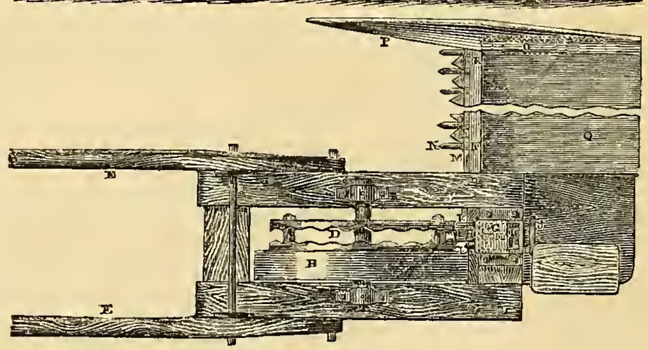
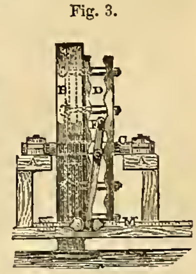


Fig. 2.

in pedestal bearings on the frame, A. The cast-iron cam discs, D, are attached to each other, and to the arms of the main wheel, B, by bolts passing through fitting pieces on the cams and wheel. Each disc has a series of undulations on its circumference, the difference between the projections and the hollows of the corrugated parts being one inch. At the bottoms of the hollows the discs are one inch thick at the thinnest part, and they are two inches deep. The curved course or groove between them is three inches wide at the outer periphery, and slightly less at the inner, the cams being bevelled. The machine is fitted with the usual shafts, E, or if preferred, with a single pole. The lever, F, is keyed on the spindle, H, which works in the bearing, G. The lever may be made of wrought-iron, or if preferred, of steel. The lever, F, has fixed to its upper end a pin. Upon this pin a roller is fitted, as large as can move freely round the curved course. This roller being alternately acted on by the two opposite cams, causes the lever to oscillate by the progressive motion of the main wheel over the ground. The pin is placed at a point in the lever nearer to its upper than its lower end, which lower end acts by a connecting rod or other convenient means, upon the usual straight cutter rod on which the knives or cutters are fixed in the ordinary way. The lever thus gives the usual back and forward motion to the cutters. According as the pin is placed proportionally higher or lower on the lever, the motion given to the cutters, of course, bears a greater or less proportion to the displacement of the roller and pin by the curves.

Fig. 3.



The bearing, G, slides in a dove-tailed groove, and is moved to and fro therein by the endless screw, I, partly shown behind it, which passes under it and through a nut in the bearing. The screw is worked by the small hand wheel, J. Upon the portion of the finger bar, K, which passes under the frame of the main wheel, B, two steel springs, L, are fixed; these springs are placed on their edges, pointing forwards, and project far enough to receive the impact of the lever, F, shortly before the limit of each oscillation. The springs receive an impact from the lever, when it has passed through the greater part of its oscillation to that side, and by retarding the stroke keeps up the pressure longer and more steadily on the cam which drives the lever in that direction. The reverse motion by the opposite cam is then more easily communicated. The cutter bar, M, is fitted with angular cutters of the common sort, working through fingers, N, the outer end is borne up by the small wheel, O, the cut and standing grain being separated by the divider, P. When grass is to be mown the grain platform, Q, is made to lift out of the frame by unscrewing the bolts which hold it down.

The cutters are put into and out of gear as follows:—The bearing of the lever shaft is arranged to slide in a dove-tailed groove which is securely fixed on the frame of the main wheel, and so placed that the bearing can only move backwards or forwards to and from the cams. When the machine is moved forward it places the roller betwixt the cams and in the proper position for being acted on by them; and when moved backwards it withdraws the roller so as not to be acted on. When the bearing has been moved forward it is secured in its place by a bolt or other convenient means. A good means for both moving it backward and forward, and of securing it, is by an endless screw and nut. By turning the screw the bearing is made to move backwards or forwards as required. When it has been far enough moved forward the screw may be prevented from receding by a catch holding into a ratchet wheel.

LAW REPORTS OF PATENT CASES.

Puddled Steel: Mayer, *et. al. v.* Spence, *and al.*—This was an action tried at Liverpool, before Mr. Baron Wilde and a special jury, for the infringement of a patent for an improvement in the manufacture of steel, the inventor and patentee making steel by one process, in the manufacture of the iron in the puddling furnace.

Previous to 1850 the mode of making steel was costly and tedious; the manufacturer, in making the iron in the puddling furnace was compelled to deprive it totally of its carbon, and then, in order to convert that decarbonized iron into steel, it was necessary to subject it to another costly process, heating it with charcoal, by which a certain amount of carbon was re-imparted to it. An ingenious German, named Ewald Riepe, who was connected with the manufacture of steel, applied himself to discover some means of facilitating this clumsy and tedious process, and by an invention which he discovered and patented in 1850 achieved that result. The means by which this was accomplished was by almost entirely excluding the atmospheric air from the iron at a certain stage of its manufacture while in the process of puddling. By using this means only one operation was needed, and steel was produced fit for the hammer direct from the puddling furnace, and the tedious process of re-carbonizing the metal was dispensed with. An important part of the invention consisted in the manipulation of the "damper" on the top of the furnace, which was used to check the heat of the furnace at a certain point when the metal was partially decarbonized, and by excluding the atmospheric air the remaining carbon was prevented being evolved from the mass. This invention was of the greatest possible utility in its results, cheapening the cost of the production of steel, shortening the time required in the process, and producing a better commercial article. It could not be possible, nor was it credible that a process which gave such great and beneficial results could have been known and not practised before Ewald Riepe discovered it. All manufacturers eagerly sought after it, and all were on the look out for such an invention. The patent had been worked for several years, but last year it was discovered that it had been infringed, and that the defendant was infringing it at his works at Workington, near Carlisle. A visit of inspection was consequently made by several eminent gentlemen, who were met by Mr. Spence and Dr. Lyon Playfair, and they found that although the process was carried out with several colourable alterations, yet it was substantially the process patented by Mr. Riepe, and the present action was, therefore, brought for the infringement of the patent by the plaintiff, who had purchased it. These facts were proved on behalf of the plaintiff, and that the steel manufactured by the patent was much lighter and stronger than iron when made up for shipbuilding, for building, or for ordnance purposes, and that weight for weight it was worth four times as much as iron.

For the defendant witnesses were called who proved that a similar mode of manufacture to that used by the patentee had been used by them fifteen years ago. On this evidence, his Lordship (on the plaintiff's election) nonsuited the plaintiff on the ground that the invention was not new, on the plea denying the novelty of the invention.

It was intimated in the discussion, on his Lordship's ruling, that the opinion of the Court above would be taken whether the evidence called for the defence justified his Lordship's ruling on that evidence.

The Great Eastern in Court.—Proceedings for the Infringement of an American Patent.—The "big ship" is constantly getting into hot water. The latest difficulty is a suit brought against her for infringing an American patent. It seems that her motive power is solely an American idea, to the knowledge of which the *Great Eastern* owes its origin. The particulars of the suit will be gathered from the following letter, written at the suggestion of her commander. The directors failed to respond, and consequently the suit has been commenced in the Circuit Court of the United States. The damages are laid at fifty thousand dollars:—

122 Broadway, New York, July 28, 1860.

Captain J. Vine Hall,—

Dear Sir,—In compliance with your request, it affords us great pleasure to send, for submission to your directors, a statement of the facts presented in our conversation to-day.

On the 14th of March, 1848, James Eluathan Smith, of Greenport, New York, obtained letters patent of the United States, numbered 5468, for a new and useful "improvement in propellers for vessels," by the combined use of the side wheel and stern screw. Application was then made to the English engineers, Brunel and Stephenson, to examine and test the feasibility of the combination. They pronounced it impracticable, and yet the Great Eastern has been constructed upon precisely this plan.

Charles J. Gilbert and Samuel T. Armstrong, of this city, are the owners, by assignment, of this patent. These gentlemen have consulted in reference to their rights, and we have advised them, that while our laws concede to foreign vessels the privilege of using an American patent, they restrict such use to the arrival and departure from our ports, and do not permit traffic in American waters.

We deem the proposed excursion of the Great Eastern to Cape May an infringement of their patent, being neither within the letter nor the spirit of those decisions which permit the vessels of a foreign friendly nation (using an American patent in their construction or equipment) to enter our ports for purposes of trade.

In the case of Brown *v.* Duchesne, Judge Curtis held, "That the patent laws of the United States are not extended over foreign vessels visiting our ports, so as to affect the structure or equipment which they bring hither" And Chief Justice Taney in the same case announced as the opinion of the Appellate Court that "the rights of property and exclusive use granted to a patentee do not extend to a foreign vessel lawfully entering one of our ports; and that the use of such improvement in the construction, fitting out, or equipment of such vessel, while she is coming into or going out of a port of the United States, is not an infringement of the rights of an American patentee, provided it was placed upon her in a foreign port, and authorised by the laws of the country to which she belongs."

The opposite doctrine was held in England in the case of Caldwell *v.* Vlissenger, in which Sir George James Turner, Vice-Chancellor, decided that the exclusive right under an English patent will be enforced against foreigners while in England, in the same way and to the same extent as it would against British subjects; and, therefore, where the foreign owners caused to be made in their own country and attached to their vessel a steam screw propeller, the manufacture and use of which was unrestrained by law there, but restricted in England by a patent, and afterwards sent the vessel with a cargo for the purpose of trade to England, the use of the steam propeller was restrained by injunction while the vessel should be within the waters covered by the English patent. He adds:—"This is a question of national policy, and it is for the Legislature, and not for the courts, to deal with that question. My duty is to administer the law, and not to make it." And Sir William Page Wood, the counsel for the respondents, concurring in the decision, did not appeal the case, but to remedy the inconveniences in the application of the law, caused the passage of section 26 of the Act of 15 and 16 of Victoria, chapter 83, in accordance with the suggestion of the Vice Chancellor.

Our courts, without the aid of legislation, recognise the right of foreign vessels to use patented American improvements, but only while the vessel is engaged in commerce between our own and a foreign country. It certainly never was designed to be so extended as to permit vessels to come here, abandon their foreign traffic, take out a special coasting license, and run excursions in American waters. Under such circumstances the vessel loses its distinctive foreign character, and the exemption that exists in the case of foreign trade no longer applies.

We do not desire to embarrass in the slightest degree the movements of your vessel both because we highly appreciate the enterprize of those who have sent the Great Eastern to our waters, and for the reason that we are disinclined to proceed against those who have practically demonstrated the feasibility and advantage of our improvement; at the same time we feel that this excursion ought not to be made by you without some distinctive recognition of our rights. If, therefore, the directors would make some such acknowledgment as was suggested in our conversation, we could witness her departure with pleasure, and also not permit an infringement of our rights to pass unnoticed.

With many thanks for the courteous manner in which you listened to the presentation of our case, we remain, very truly, yours, ABBETT & FULLER,

Attorneys for the Owners of the Patent.

The declaration alleges the issue of the patent, in due form of law, its assignment to the plaintiffs, its value, (which is placed at one hundred thousand dollars,) and then has the following special count, which was framed for the purpose of avoiding the application of the decision of Brown *v.* Duchesne :—

And these plaintiffs further say, that the defendant, well knowing the premises, but contriving and intending to injure the said plaintiffs in that behalf, &c., &c., on the 30th day of July, A D., 1860, &c., at the said city of New York, within the said Southern district of New York, the defendant being then the master of the steamship Great Eastern, departed from the port of New York upon a certain private excursion, and under a special coasting license from the collector of the Port of New York, for coasting along the shores of New Jersey, and of the United States, and returning again along said coast and in the waters within the jurisdiction of the United States, and at the same time and times neither being engaged in foreign traffic, nor coming into or going out of any ports of the United States, on any voyage to or from any foreign country, used as the motive power in the propulsion of said steamship, said improvement in said letters patent described in violation of the rights of these plaintiffs, &c., &c.

The following extracts from the specifications will give a general idea of the scope of the patent :—

The nature of the first part of my invention consists in combining with the paddle-wheels, constructed in any desired manner, and placed at the sides of the vessel, a propeller or propellers, placed at the stern of the vessel, the axis of which to be parallel (or nearly so) with the keel of the vessel, so that the vessel shall be impelled by the joint action of the propeller or propellers at the stern, and the paddle-wheels at the sides; such joint action having the effect, as shown by experiment, to impel the vessel with greater velocity and more steadily with a given force than by the action of the paddle-wheels or the propeller or propellers separately.

* * * * * * * * * *

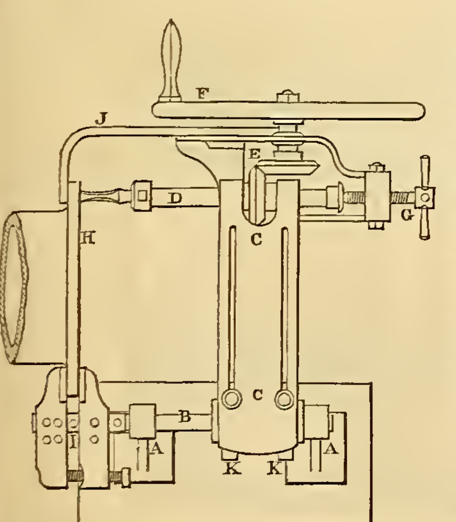
And the second part of my invention consists in placing the paddle-wheels, when used in combination with the propeller or propellers at the stern, forward of the centre of gravity of the vessel, that a portion of the action of the paddle-wheels, thus placed, may have the effect to partly lift the bow of the vessel, while the prepeller (or propellers) at the stern exerts all its action to impel the vessel forward.

REGISTERED DESIGN.

PORTABLE ADJUSTABLE DRILLING MACHINE.

Registered for M. A. Soul & Co., *Leadenhall Street, London.*

The purpose of utility to which the shape or configuration of this design has reference, is to economise time and labour in drilling holes in the flanges of pipes or other generally similar articles, for which purpose ratchet drilling braces are at present used. These tools are, however, objectionable, on account of the time consumed in the drilling operation. The accompanying engraving represents a plan of the machine as applied to the drilling of a pipe flange. The wooden base has fixed to it two standards, A, in which are fitted the bearings of the horizontal spindle, B. This spindle carries a bush to which is fitted the moveable frame, C, which extends out to some distance beyond the base, and has formed in it two parallel slots. The frame, C, is connected to the bush on the spindle, B, by means of bolts and nuts, the former pass through the longitudinal slots to admit of the lateral adjustment of the frame. At the outer extremity of the part, c, is arranged the drill spindle, D, to which rotatory motion is imparted by means of the pair of bevel wheels, E; these wheels are driven by means of the hand-wheel, F. The pressure of the drill against the metal to be bored is regulated by the end screw, G, by means of which the tool is steadily and quickly urged forward as it cuts away the metal. The flange of the pipe, H, is firmly held by the adjustable clamp, I, and by the forked guide, J, which extends from the frame, C, over the drill, D. The frame, C, can also be fixed in any angular position by means of the screw pins, K, which pass through the bush on the spindle, B, and serve to secure the bush in any desired position on the spindle. In this way the drill can be readily brought round to any point within the circumference of the flange, whilst its traverse in a lateral direction is arranged with equal facility by loosening the nuts of the bolts which pass through the slots in the frame, C. The speed of the drill may also be varied by altering the position of the handle in the wheel, F; the handle moves to and fro in a slot formed in one of the arms of the wheel, and is fixed at the required distance from the centre by a screw and nut. The compactness and portability of the machine admits of its being used in confined spaces, as, for example, on board steam ships, for which purpose it was more especially designed.



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REVIEWS OF NEW BOOKS.

The Micrographic Dictionary; A Guide to the Examination and Investigation of Structure and Nature of Microscopic Objects. By J. W. Griffith, M.D., and Arthur Henfrey, (late) Professor of Botany in King's College, London. 2d edition. Illustrated by 45 plates and 812 woodcuts. Van Voorst. 1860. pp. xl. 752.

This is a very valuable assistant to all persons who use the microscope for purposes of scientific investigation, or for the pleasure of surveying the curious and the beautiful in the minute. There is now a large sale of microscopes in this country, and the manufacture of the instrument has been carried to a high pitch of excellence. Observers are numerous and are increasing rapidly. Their aims and tastes are diversified, some being truly men of science, who pry into nature with the object of discovering her secrets, but with the greater number amusement is the sole end in view. As a guide in finding the objects of most interest amongst the vast crowd of things upon our globe and as an aid to the intelligent examination of them, the book before us will be found eminently useful. The explanations of the text are greatly assisted by the abundant engravings and woodcuts. The practical worker will here find instructions how to prepare, and preserve for future examination, the many objects that have been brought under the dominion of the instrument. The naturalist has here a storehouse of facts as to the minute structure of the two organised kingdoms of nature. In a work of reference of this kind it is evidently highly desirable to compress the information it undertakes to give into the smallest space, and we think the authors have generally been successful in their attempts to do so. There is always much difficulty when the subject has an extensive range, to limit the matter strictly within legitimate bounds. On this head we cannot find much fault with the authors, whilst we cannot say that they have altogether succeeded in drawing the line between what could be properly admitted and what properly rejected. For instance, the numerous articles on ferns, most of them with cuts (*adiantum, aspidium, pteris,* &c.), are out of place in a work like this which does not undertake to teach botany. All that need be said about the *filices* is given under the head of *ferns,* and it is a waste of space to return to the subject under the name of the *genera* The article *thuja,* and a few others, are open to a similar objection. On the other hand we can find no information as to *thalassicolla* or *ediometra,* and the article, *polygastina,* referring to a very interesting class of objects, is far too short, and the figures are few and poor. Müller's Memoir, though quoted, cannot have been referred to, or we should have had a longer account of them. The Mediterranean is not mentioned as one of the localities where they have been found. Moreover, the Bermuda referred to is not one of the group of islands belonging to the British Crown, as might be supposed, but a "hundred" called Bermuda, near Richmond, Virginia. Professor Huxley's paper on *thalassicolla*, in the Annals and Magazine of Natural History for 1851, ought to have been cited. In the bibliography of Spongiæ, none of Dr. Bowerbank's numerous memoirs later than 1840 have been referred to. To conclude with a piece of commendation, it adds very much to the utility of a work which figures magnified objects, to state how many times they have been enlarged, and that has been done here. In many works, even of high reputation, such as Dr. Carpenter's volume on the Microscope, the reader is left at a loss on this point. He cannot tell whether any given figure represents the object magnified to the extent of ten, a hundred, or a thousand times.

A Supplement to a List with Descriptions, Illustrations, and Prices, of whatever relates to Aquaria. By W. Alfred Lloyd, 19 Portland Road, London. 1860.

Mr. Lloyd being not only a dealer in aquaria and their accession, but an enthusiastic student of the art of keeping live animals in them, has come to be looked upon as our first authority on such matters. The illustrated list, to which this little pamphlet, of 34 pages and 13 woodcuts, is a supplement, contained a great deal of information of an original kind, and it therefore commands a steady sale, though put forth merely as a tradesman's annotated catalogue. Further improvements having been made, and discoveries in the management and arrangement of aquaria, of a not unimportant nature, having been obtained, they are now published in the pamphlet before us. Economy is now made an essential point, and with this is combined the qualities of efficiency and neatness, so that Mr. Lloyd looks forward to a large extension of the pursuit. If the number of books published of late years about aquaria, be any test of their popularity, a multitude must have been brought into use—how far successfully we do not know. However, Mr. Lloyd hastens to help them with his latest discoveries on the subject.

Photographic Quarterly Review. Edited by Thomas Sutton, B.A. London: Sampson, Low, Son, & Co. 1860.

This is a new periodical devoted to the fascinating science of photography, edited by Mr. Sutton, who is well known as a successful master of the art. His new panoramic lens we have recently had occasion to notice in our pages. The editor informs us that the object of his review is to record systematically the progress of photography from quarter to quarter; to discuss the various scientific questions which arise in connection with it; to describe fully the various novelties which may be introduced in processes and apparatus; and to give the whole photographic views relating to patents, exhibitions, proceedings of societies, new books, and useful applications of the art; together with general gossip about what is doing in photography, at home and abroad. The first number contains a great deal of useful matter, and ought to be welcomed by all classes of photographers, especially amateurs. The articles are clearly explanatory and the different processes made quite intelligible.

Elementary Examples in Practical Mechanics; comprising copious Explanations and Proofs of the Fundamental Propositions. By the Rev. John F. Twisden, M.A., Professor of Mathematics in the Staff College, London. Longman & Co. 1860.

To the increasing class of young men who study the mathematical principles of mechanics with a view to their practical application—the only sound method of learning the profession of engineering—this work will be very useful. It is designed as an introduction to "Applied Mechanics," and as a preparation for the study of such works as Moseley's "Mechanical Principles of Engineering," Willis's "Principles of Mechanics," and Dr. Rankine's "Applied Mechanics." It is divided into two courses, the first of which may be read by any one who understands arithmetic, a little algebra, practical geometry, and the rules of mensuration. In this course the principles of the science are simply expounded, their formal demonstration being reserved to the second course, which pre-supposes in the student an acquaintance with Euclid, algebra, and trigonometry, as taught in schools.

Ure's Dictionary of Arts, Manufactures, and Mines. New Edition. Longman & Co. 1860.

The principal articles in the eleventh part of this new edition are, mint (by G. F. Ansell of the Royal Mint,) Manufacture of Nails, Naphtha, Needle manufacture, Nitrogen, Nutrition, Oils, and Dressing of Ores, the last two being ample in their details.

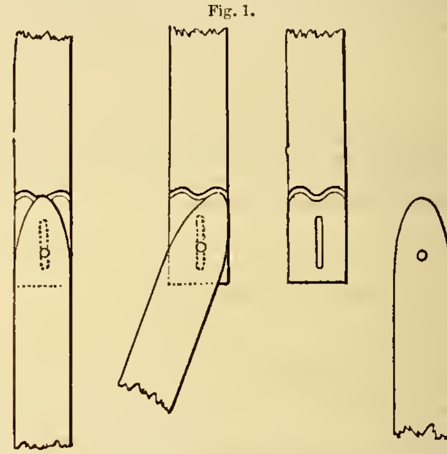
CORRESPONDENCE.

ENDLESS RAILWAY AND BOAT TRAIN.

Having of late conceived some improvements in some of my machines described in my work "Mechanical Inventions, &c.," permit me to explain some of these in the pages of your *Journal*.

In my appendage to a wheel, or endless railway, formed by a jointed eight-sided polygon around the wheel for it to roll on; during part of

Fig. 1.

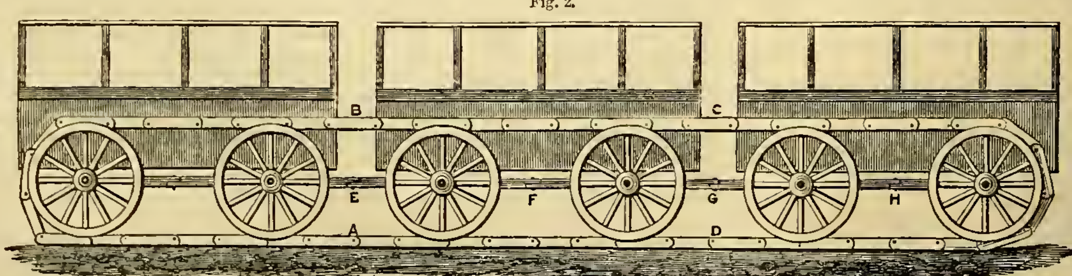


the motion the two bottom sides form a right line, and then the other six sides are nearly in contact with the wheel, but at other times only one of the sides touch the ground; and the other seven sides form an area rather too large for the wheel; which causes some knocking and noise as the different sides fall in turn against the upper part of the wheel. This may, I think, be remedied by having the sides (instead of jointed together by rivets or axles,) so formed that when the sides fold inwards they shall also contract; a very little contraction being required in each side, as they all contribute to the same effect. The arrangement is shown in fig. 1.

The end of each side has a small groove in it, in which groove a pin fast in the neighbouring side slides, and is compelled so to do by the means of a small groove cut in it, in which the pin in the other side works. The groove being so curved that as the sides fold they are also drawn in a little. This arrangement will, I think, greatly improve the machine. And if required for traction, the wheel and the inside of the rail may be toothed to prevent the wheel's slipping round within it.

This appendage may, it appears, be advantageously applied to a whole train of carriages, as shown in fig. 2, or for the front wheels of one

Fig. 2.



carriage. The middle wheels being particularly favoured in the train; as they would travel on a continued rail without being incumbered by the appendage around it.

This rail must bend freely inwards to allow it to work round the wheels, and must also have lateral flexure, to allow of turning; but must be unyielding outwards, so that any obstacles in the road shall not bind it, and thus impede the action. This is done by causing the ends of the rails to butt against one another outwards, but being rounded on the insides. The appendage are indicated by the letters, A, B, and the

Fig. 3.

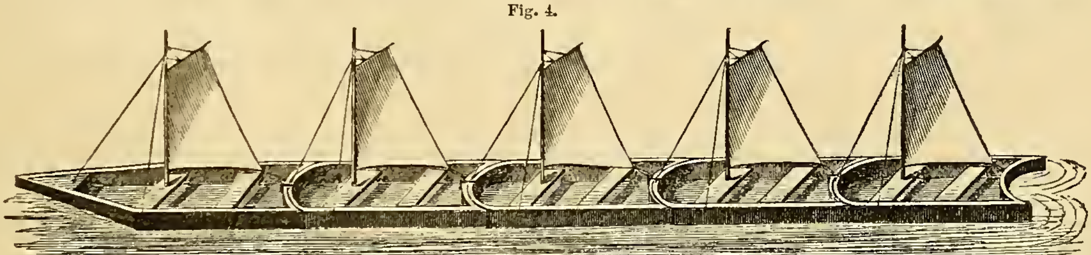
carriages are jointed together at E, F, and G, so that they can move horizontally, in order to allow the train to turn. But in so doing, the axles, unfortunately, diverge from each other so as to cause the chain of rails to overreach the wheels, with a liability of the wheels getting off the rails.

The best way to remedy this evil will be by causing one wheel on each side, to have a sliding motion, endwise, in a contrary way to this divergence: so that when the chain has become too long for the wheels, the end wheel extends so as to fill up the vacancy, and thus keeps the chain tight; the end wheel being thereby kept close to the end of the envelope.

In order for the train to turn, the external carriages must turn contrarily from each other, they, therefore, each have an *arm* with a *rack* at the end described from the centre, which unites the carriages, and meeting in the middle carriage, as shown in fig. 3; but it must be recollected that though this train works well *as a train*, it is very inferior to my square wheels which step over obstacles by means of a choncoid curve.

Having many years ago suggested that a great advantage in speed and in saving labour would be obtained by connecting a number of vessels together, so as not to admit of the water coming between them, as the progress of a long train does not displace more water than one boat, but finding that Mr Bourne has (I hope, inadvertently,) of late patented and successfully applied the invention on the Thames, and abroad, I have here given an illustration of my plan in fig. 4, but my vessels are differently shaped to Mr. Bourne's. Mine have the last vessel with a concave stern, while his is convex, according to the common plan; but mine does not confine itself to the shape, though it has been proved that my plan of a concave stern, flat bottom, and perpendicular sides, is the best, both for speed and safety against upsetting. The concave

Fig. 4.



stern serves for the back water to press against and thus urges the vessel on, while the angular prow cleaves to the fluid. They may be secured to each other by a hook fast in one and loose in the other. It is indeed remarkable that this system of arranging boats in trains should have been overlooked for so many ages.

By this plan it appears that very great speed of vessels may be effected, particularly if the front ones decrease in size so as to form an acute angle of the train. LEWIS GOMPERTZ.

London, September, 1860.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

THE BRITISH ASSOCIATION AT OXFORD, 1860.

The following is a list of the papers read, with a resumé of the more interesting ones:—

SECTION D.—ZOOLOGY AND BOTANY, INCLUDING PHYSIOLOGY.

"On the progress of natural science in the United States and Canada," by the Rev. P. P. Carpenter.

"On the final causes of the sexuality of plants, with particular reference to Mr. Darwin's work, "On the origin of species by natural selection," by Dr. Daubeny.

"Dr. Daubeny began by pointing out the identity between the two modes by which the multiplication of plants is brought about, the very same properties being imparted to the bud or to the graft as to the seed produced by the ordinary process of fecundation, and a new individual being in either instance equally produced. We are, therefore, led to speculate as to the final cause of the existence of sexual organs in plants, as well as in those lower animals which can be propagated by cuttings. One use, no doubt, may be the dissemination of the species; for many plants, if propagated by buds alone, would be in a manner confined to a single spot. Another secondary use is the production of fruits which afford nourishment to animals. A third may be to minister to the gratification of the senses of man by the beauty of their forms and colours. But as these ends are only answered in a small proportion of cases, we must seek further for the uses of the organs in question; and hence the author suggested that they might have been provided, in order to prevent that uniformity in the aspect of nature, which would have prevailed if plants had been multiplied exclusively by buds. It is well known that a bud is a mere counterpart of the stock from whence it springs, so that we are always sure of obtaining the very same description of fruit by merely grafting a bud or cutting of a pear or apple tree upon another plant of the same species. On the other hand, the seed never produces an individual exactly like the plant from which it sprang; and hence, by the union of the sexes in plants, some variation from the primitive type is sure to result. Dr. Daubeny remarked that if we adopt in any degree the views of Mr. Darwin with respect to the origin of species by natural selection, the creation of sexual organs in plants might be regarded as intended to promote this specific object. Whilst, however, he gave his assent to the Darwinian hypothesis, as likely to aid us in reducing the number of existing species, he wished not to be considered as advocating it to the extent to which the author seems disposed to carry it. He rather desired to recommend to naturalists the necessity of further inquiries, in order to fix the limits within which the doctrine proposed by Mr. Darwin may assist us in distinguishing varieties from species.

Prof. Huxley, having been called on by the chairman, deprecated any discussion on the general question of the truth of Mr. Darwin's theory. He felt that a general audience, in which sentiment would unduly interfere with intellect, was not the public before which such a discussion should be carried on. Dr. Daubeny had brought forth nothing new to demand or require remark.

Mr. R. Dowden, of Cork, mentioned, first, two instances in which plants had been disseminated by seeds, which could not be effected by buds; first, in the introduction of *senecio squalida*, by the late Rev. W. Hincks; and, second, in the diffusion of chicory, in the vicinity of Cork, by the agency of its winged seeds. He related several anecdotes of a monkey, to show that however highly organized the quadrumana might be, they were very inferior in intellectual qualities to the dog, the elephant, and other animals. He particularly referred to his monkey being fond of playing with a hammer; but although he liked oysters as food, he never could teach him to break the oysters with his hammer as a means of indulging his appetite.

Dr. Wright stated that a friend of his, who had gone out to report on the habits of the gorilla—the highest form of monkey—had observed that the female gorilla took its young to the sea-shore for the purpose of feeding them on oysters, which they broke with great facility.

Prof. Owen wished to approach this subject in the spirit of the philosopher, and expressed his conviction that there were facts by which the public could come to some conclusion with regard to the probabilities of the truth of Mr. Darwin's theory. Whilst giving all praise to Mr. Darwin for the courage with which he had put forth his theory, he felt it must be tested by facts. As a contribution to the facts by which the theory must be tested, he would refer to the structure of the highest quadrumana as compared with man. Taking the brain of the gorilla, it presented more differences, as compared with the brain of man, than it did when compared with the brains of the very lowest and most problematical form of the quadrumana. The deficiencies in cerebral structure between the gorilla and man were immense. The posterior lobes of the cerebrum in man presented parts which were wholly absent in the gorilla. The same remarkable differences of structure were seen in other parts of the body; yet he would especially refer to the structure of the great toe in man, which was constructed to enable him to assume the upright position; whilst in the lower monkeys it was impossible, from the structure of their feet, that they should do so. He concluded by urging on the physiologist the necessity of experiment. The chemist, when in doubt, decided his questions by experiment; and this was what was needed by the physiologist.

Prof. Huxley begged to be permitted to reply to Prof. Owen. He denied altogether that the difference between the brain of the gorilla and man was so great as represented by Prof. Owen, and appealed to the published dissections of Tiedemann and others. From the study of the structure of the brain of the quadrumana, he maintained that the difference between man and the highest monkey was not so great as between the highest and the lowest monkey. He maintained also, with regard to the limbs, that there was more difference between the toeless monkeys and the gorilla than between the latter and man. He believed that the great feature which distinguished man from the monkey was the gift of speech.

Prof. Greene, of Cork, read his "report on the present state of our knowledge of the group medusidæ."

Dr. Lankester read a paper for Mr. Hogg, "On a fourth kingdom of nature."

Mr. Westwood read a paper, "On a lepidopterous parasite occurring on the body of the *fulgora candelaria*."

"Report on experiments in the growth of plants," by Prof. Buckman.

"On some specimens of shells from the Liverpool Museum, originally from the pathological collection formed by the late Mr. Gaskoin," by the Rev. H. H. Higgins, Rainhill, Liverpool.

Dr. Lankester read a paper from Dr. Dresser, "On certain abnormal conditions of the flower in *passiflora cærulea*."

"On the hard parts of fern-stems," by Dr. Ogilvie, of Aberdeen.

"On the British teredines, or ship-worms," by Mr. Jeffreys.

After observing that his researches had not been confined to the British teredines but, that he had recently had an opportunity of meeting all the French naturalists who had published on the subject, as well as of studying all the accessible collections and books, he treated the matter first in a zoological point of view, and gave a short history of the genus teredo, from the time of Aristotle and his pupil Theophrastus to the present time; especially noticing the elaborate monograph of Sellius, in 1733, on the Dutch ship-worm; the valuable paper of Sir Everard Home and his pupil Sir Benjamin Brodie, in 1806; and the physiological essays of Quatrefages, in 1849. He showed that the teredo undergoes a series of metamorphoses; the eggs being developed into a sub-larval form after their exclusion from the ovary, and remaining in the mouth of the parent for some time. In its second phase (or that of proper larvæ), the fry are furnished with a pair of close-fitting oval valves, resembling those of a cythere, as well as with cilia, a large foot, and distinct eyes, by means of which it swims freely and with great rapidity, or creeps, and afterwards selects its fixed habitation. The larval state continues for upwards of 100 hours, and during that period the fry are capable of traversing long distances, and thus becoming spread over comparatively wide areas. The metamorphosis is not, however (as Quatrefages asserts), complete; because the young shell, when fully developed, retains the larval valves. He then discussed the different theories, as to the method by which the teredo perforates wood, giving a preference to that of Sellius and Quatrefages, which may be termed the theory of "suction," aided by a constant maceration of the wood by water, which is introduced into the tube by the syphons. This process, according to Quatrefages, is effected by an organ which he calls the "*capuchon céphalique*," and which is provided with two pair of muscles of extraordinary strength. Mr. Jeffreys instanced, in illustration of his theory, the cases of the common limpet, as well as of many bivalve molluscs, *echinus lividus*, and numerous annelids, which excavate rocks to a greater or less depth; and he cited the adage of "gutta cavat lapidem non vi sed sæpe cadendo," in opposition to the mechanical theory. The teredo bores either in the direction of the grain or across it, according to the kind of wood and the nature of the species; the *teredo norvagica* usually taking the former course: every kind of wood is indiscriminately attacked by it. The teredines constitute a peaceful though not a social community; and they have never been known to work into the tunnel of any neighbour. If they approach too near to each other, and cannot find space enough in any direction to continue their operations, they inclose the valves or anterior part of the body in a case, consisting of one or more hemispherical layers of shelly matter. Sellius supposed that the teredo ate up the wood which it excavated, and had no other food; and, labouring under the idea that it could no longer subsist after being thus voluntarily shut up, he considered it to be the pink of chivalry and honour, in preferring to commit suicide rather than infringe on its neighbour. In this inclosed state the valves often become so much altered in form, as well as in the relative proportion of their different parts, as not to be easily recognizable as belonging to the same species; and one species *(T. divaricata)* was constituted from specimens of *T. Norvagica* which had been so deformed. The food of the teredo consists of minute animalculæ, which are brought within the vortex of the inhalant syphon, and drawn into the stomach. The wood which has been excavated also undergoes a kind of digestion during its passage outwards through the long intestine. The animal has been proved by Laurent and other observers to be capable of renewing its shelly tube, and of repairing it in any part. It is stated by Quatrefages (and apparently with truth) that the sexes are separate, impregnation being effected in a similar mode to that which takes place among palm trees and other diœcious plants. There appear to be only five or six males in one hundred individuals. The teredo perforates and inhabits sound wood only, but an allied genus (Xylophaga) has been recently found to attack the submarine telegraph cable between this country and Gibraltar at a depth of from sixty to seventy fathoms, and to have made its way through a thick wrapper of cordage into the gutta percha which covered the wires. The penetration was fortunately discovered in time, and was not deep enough to reach the wire. He gave several instances to show the rapidity of its perforating powers,—one of them having been supplied by Sir Leopold M'Clintock while he was serving with the author's brother in the North Pacific. Mr. Jeffreys then traced the geographical distribution of the teredines, and showed that at least two species, which are now found living on our own shores, occurred in the post-pleistocene period; and he inferred from the circumstance of one of these species having been found in fossil *drift* wood, that conditions similar to the present existed during that epoch. Some species inhabit fixed wood, and may be termed "littoral," while others are only found in floating wood, and appear to be "pelagic." Each geographical district has its own "littoral" species, and the old notion of the ship-worm (which Linnæus justly called "*calamitas navium*,") having been introduced into Europe from the Indies was contrary to fact as well as theory, because no "littoral" species belonging to tropical seas has ever been found living in the northern hemisphere, or *vice versa*. It is true that some species have been occasionally imported into this and other countries in ships' bottoms, and that others occur in wood which has been wafted thither by the gulph and other oceanic currents; but the fewer cases belong to littoral species, and never survive their removal, while the latter may be said to be almost cosmopolite. Every species of teredo has its own peculiar tube, valves, and pair of "pallets," the latter serving the office of opercula, and by their means the animal is able at will to completely close the entrance The length of the tube is, of course, equal to that of the animal, which is attached to it by strong muscles in the pallettal-ring, and varies in the different species from three inches, or even less, to as many feet. The internal entrance or throat of the tube is also distinguishable in each species by its peculiar transverse laminæ, and frequently a longitudinal siphonal ridge. Monstrosities not unfrequently occur in the valves and pallets, and in one instance the pallet stalk is double, showing a partial redundancy of organs, as exemplified by the author with respect to the operculum of the common whelk. More than one species often inhabit the same piece of wood; and want of sufficient care by naturalists in extracting the valves with their proper tubes and pallets may account in a great measure for the confusion which exists in public and private collections, and which has thence found its way into systematic works. The teredines have many natural enemies, both in life and after death. In the south of Italy, and on the North African coast, they are esteemed as human food. In Great Britain and Ireland, four species occur in fixed wood, and eleven others in drift wood, the latter being occasional visitants. Of these, no less than six have never yet been described, and two others are now, for the first time, noticed as British. The number of recorded exotic species only amounts to six more, making a total of twenty-one; but it is probable that, when the subject has been more investigated, a considerable addition will be made to this number. Mr. Jeffreys then explained the distribution of the littoral species on the shores of Great Britain and Ireland, and produced a synoptical list with descriptions of the new species. He believed all the teredines were marine, except, possibly, Adamson's Senegal species, and one which had lately been found in the river Ganges, the water of which is fresh for about eighteen hours out of the twenty-four, and brackish during the rest of the day; but as a well-known exception of the same kind occurs in a genus of marine shells (arca), and the transition from fresh to brackish, and thence to salt water, is very gradual, such exceptions should not be regarded with suspicion or surprise. He concluded this part of the subject by exhibiting some drawings and specimens, and acknowledging his obligations to Dr. Lukis and other scientific friends. He next treated the subject in an economical point of view, and remarked that, although the French government had issued two commissions at different times, and the Dutch government has lately published the report of another commission, which was appointed to inquire into the mode of preventing the ravages of the teredo in the ships and harbours of those countries, our own government had done nothing. He alluded to the numerous and various remedies which had been proposed during the last two or three centuries, from time to time, some of which were very absurd; but he considered, from a study of the creature's habits, that the most effectual preventive would be a silicious or mineral composition, like that which has been proposed by Prof. Ansted for coating the decomposing stones of our new Houses of Parliament, or simply a thick coat of tar or paint, continually applied, which would not only destroy any adult ship-worms then living in the wood, but prevent the ingress of the fry. The teredo never commences perforation except in the larval state.

A committee of the Association has been formed, at the suggestion of Mr. Jeffreys, to inquire and report as to the best mode of preventing the ravages of teredo and other animals in our ships and harbours.

A report from Dr. Kineham, "On the results of dredging in Dublin Bay," was communicated to the section through Mr. M'Andrew, who read a report from the general dredging committee, and laid on the table a set of blank forms which had been printed by the committee for the purpose of being filled up by those who were engaged in dredging.

Dr. Collingwood read a paper "On recurrent animal form, and its significance in systematic zoology."

The object of this paper was to call attention to the frequent recurrence of similar forms in widely-separated groups of the animal kingdom; similarities, therefore, which were unaccompanied by homologies of internal structure. These analogies of form had greatly influenced the progress of classification, by attracting the attention of systematizers while as yet structural homoligies were imperfectly understood; and, as a consequence, many groups of animals had been temporarily located in a false position, such as bats and whales by the ancients, and the polyzoa and foraminifera in more modern times. These resemblances in form were illustrated generally by the classes of vertebrata, and more especially by the various orders of mammalia,—the invertebrata affording, however, many remarkable examples. Since no principle of gradation of form would sufficiently account for these analogies, the author had endeavoured to discover some other explanation, and had come to the conclusion, that the fact of deviations from typical *form* being accompanied by modifications of typical *habits*, afforded the desired clue. Examples of this were given, and the principle educed, that *agreement of habit and economy in widely-separated groups is accompanied by similarity of form.* This position, was argued through simple cases to the more complex, and the conclusion arrived at, that where habits were *known*, the explanation sufficed; and it was only in the case of animals of low organization and obscure or unknown habits, that any serious difficulty arose in its application; so that our appreciation of the *rationale* of their similarity of form was in direct ratio to our knowledge of their habits and modes of life. In conclusion, by a comparison of the polyzoa with the polyps, it was shown that the economy of both was nearly identical, although they possessed scarcely anything in common except superficial characters; and this identity of habit was regarded as the explanation of their remarkble similarity of form.

"On the intellectual development of Europe, considered with reference to the views of Mr. Darwin and others, that the progression or organisms is determined by law," by Prof. Draper, M.D., of New York.

The reading of this paper led to an animated discussion of Mr. Darwin's theory, in the course of which Prof. Huxley defended Mr Darwin's theory from the charge of its being merely an hypothesis. He said, it was an explanation of phenomena in natural history, as the undulating theory was of the phenomena of light. No one objected to that theory because an undulation of light had never been arrested and measured. Darwin's theory was an explanation of facts; and his book was full of new facts, all bearing on his theory. Without asserting that every part of the theory had been confirmed, he maintained that it was the best explanation of the origin of species which had yet been offered. With regard to the psychological distinction between man and animals; man himself was once a monad—a mere atom, and nobody could say at what moment in the history of his development he became consciously intelligent. The question was not so much one of a transmutation or transition of species, as of the production of forms which became permanent. Thus the short-legged sheep of America were not produced gradually, but originated in the birth of an original parent of the whole stock, which had been kept up by a rigid system of artificial selection.

Dr. Hooker observed, that the Bishop of Oxford having asserted that all men of science were hostile to Mr. Darwin's hypothesis,—whereas he himself was favourable to it,—he could not presume to address the audience as a scientific authority. As, however, he had been asked for his opinion, he would briefly give it. In the first place, the Bishop had, as it appeared to him, completely misunderstood Mr. Darwin's hypothesis: and had intimated that this maintained the doctrine of the transmutation of existing species one into another, and had confounded this with that of the successive development of species by variation and natural selection. The first of these doctrines was so wholly opposed to the facts, reasonings, and results of Mr. Darwin's work, that he could not conceive how any one who had read it could make such a mistake—the whole book, indeed, being a protest against that doctrine. Then, again, with regard to the general phenomena of species, he understood the Bishop to affirm that these did not present characters that should lead careful and philosophical naturalists to favour Mr. Darwin's views. To this assertion Dr. Hooker's experience of the vegetable kingdom was diametrically opposed. He considered that at least one half of the known kinds of plants were disposable in groups, of which the species were connected by varying characters common to all in that group, and sensibly differing in some individuals only of each species; so much so, that if each group be likened to a cob-web, and one species be supposed to stand in the centre of that web, its varying characters might be compared to the radiating and concentric threads, when the other species would be represented by the points of union of these; in short, that the general characteristics of orders, genera, and species amongst plants differed in degrees only from those of varieties, and afforded the strongest countenance to Mr. Darwin's hypothesis. As regarded his own acceptation of Mr. Darwin's views, he expressely disavowed having adopted them as a creed. He knew no creeds in scientific matters. He had early begun the study of natural science under the idea that species were original creations; and it should be steadily kept in view that this was merely another hypothesis, which in the abstract was neither more nor less entitled to acceptance than Mr. Darwin's; neither was, in the present state of science, capable of demonstration, and each must be tested by its power of explaining the mutual dependence of the phenomena of life. For many years he had held to the old hypothesis, having no better established one to adopt, though the progress of botany had, in the interim, developed no new facts that favoured it, but a host of most suggestive objections to it. On the other hand, having fifteen years ago been privately made acquainted with Mr. Darwin's views, he had during that period applied these to botanical investigations of all kinds in the most distant parts of the globe, as well as to the study of some of the largest and most different floras at home. Now, then, Mr. Darwin had published it, he had no hesitation in publicly adopting his hypothesis, as that which offers by far the most probable explanation of all the phenomena presented by the classification, distribution, structure, and development of plants in a state of nature and under cultivation; and he should, therefore, continue to use his hypothesis as the best weapon for future research, holding himself ready to lay it down should a better be forthcoming, or should the now abandoned doctrine of original creations regain all it had lost in his experience.

"On the woody fibres of flowering and cryptogamic plants," by Dr. Ogilvie.
Dr. Wright read a paper from Mr. Price, of Birkenhead, "On the genus cydippe"
"On the acclimatization of animals, birds, &c., in the United Kingdom," by Mr. F. T. Buckland.
Mr. Westwood read a communication from Prof. Verloren, "On the effect of temperature and time on the development of certain lepidoptera."
Mr. H. T. Stainton read a paper, "On some peculiar forms amongst the larvæ of the micro-lepidoptera."
"On the *aspergillum*, or watering-pot mollusc," by Mr. Lovell Reeve.
"On the value of development in systematic zoology and animal morphology," by Prof. Carus.

Prof. Carus expressed his conviction that the tendency of systematists at the present day was to overrate the importance of embryological conditions in relation to the classification of animals. He believed the homologies of organs could be made out without reference to their embryological distinctions.

Prof. Huxley maintained that the true homologies of organs, in a large number of cases, could not be made out without reference to their embryological conditions, and gave as an instance the fore extremities of the turtle.

Mr. D. C. Collingwood, of Liverpool, read a paper, "On some new forms of nudibranchiate mollusca, found in the River Mersey."
Mr. T. M. Masters read a paper "On the morphology of some monstrous forms of plants."

The paper was illustrated by a large number of recent and dried forms of monstrous plants and parts of plants.

"Notice of British well shrimps," by the Rev. A. Hogan.

The Rev. Prof. Henslow made some remarks on the growth of wheat obtained from mummies. He introduced his observations by reading a letter from Prof. Wartmann, of Geneva, who had recently found that seeds might be exposed to a temperature of 198° below zero of Fahrenheit's scale, without losing the power of germination. Prof. Henslow had himself exposed seeds to the temperature of boiling water, and they germinated. The question of how long seeds would retain their vitality was one of great interest; and a committee of this association had reported on the subject, but they had not succeeded in making seeds grow which had been kept more than two centuries. He then showed that all experiments recorded on the growth of mummy wheat were fallacious, and especially noticed the case which had been relied on so much, of the growth of mummy wheat by the Rev. Mr. Tupper from some seeds supplied him by Sir Gardner Wilkinson. The mummy wheat in this case was known to have been removed in jars that had been used for storing recent wheat. He then alluded to the raspberry seeds from the stomach of a warrior, found in the neighbourhood of Corfe Castle, and stated that the old seeds were actually exhibited at the Horticultural Society on the same tables with recent ones, so that they might easily have been mixed.

Mr. Westwood read a paper "On mummy beetles."
Dr. E. P. Wright read some notes "On *tomopteris onisciformis*."

Sub-Section D.—Physiology.

"On leptocephalidæ, their anatomy and systematic position," by Prof. Carus.
"The action of tea and alcohol contrasted," by Dr. E. Smith.
"On Asiatic cholera," by Sir C. Grey.
"On the function of the spinal cord and its morbid changes," by M. Garner.
"On a hydro-spirometer," by Dr. Lewis.
"On the development of buccinum," by Mr. J. Lubbock.
"Contributions to the theory of cardiac inhibition," by Dr. M. Foster.
"On the development of pyrosoma," by Prof. Huxley.
"On the ultimate arrangement of nerves in muscular tissue," by Prof. Beale.
"On the nature of death by chloroform," by Dr. C. Kidd.
"An experimental inquiry into the mode of death produced by aconite," by Dr. E. R. Harvey.
"On saccharine formation in the breast," by Dr. Gibb.
"On the influence of systematized exercise on the expansion of the chest," by Mr. Maclaren.
"On the structure of the lepadidæ," by Mr. R. Garner.
"On the deglutition of ailmentary fluids," by Prof. Corbett.
"An experimental inquiry into the nature of sleep," by Mr. A. E. Durham.
"Some remarks on the anatomy of the potto Borneo, (*Perodicticus Bennetti*), by Prof. Van der Hoeven.
"On sugar and amyloid substance in the animal economy," by Dr. R. M'Donnell.
"Exhibition of specimens illustrating the artificial production of bone and osseous grafts," by M. Ollier.
"Experiments on muscular action from an electrical point of view," by Dr. C. B. Radcliffe.
"On the ultimate arrangement of nerves in muscular tissue," by Prof. Beale.
"On the influence of oxygen on animal bodies," by Dr. B. W. Richardson.
"On the physiological relations of the colouring matter of the bile," by Dr. Thudichum.

Section E.—Geography and Ethnolgy.

"On the formation of oceanic ice in the Arctic regions," by Capt. Sherard Osborn, R.N.
"On the lost Polar expedition and possible recovery of its scientific documents," by Capt. Parker Snow.
"On the influence of domestic animals on the progress of civilization (birds)," by John Crawford, Esq.
"On the latest discoveries in South-Central Africa," by Dr. D. Livingstone.
—The following letter from Dr. Livingstone was read to the section :—

River Shiré, Nov. 4, 1859.

The river Shiré has its source in the green waters of the great Lake Nyassa (lat. 14 deg. 23 min. S., long., 35 deg. 30 min. E.). It flows serenely on in a southerly direction, a fine navigable stream from 80 to 120 yards in breadth, expanding some twelve or fifteen miles from Nyassa into a beautiful lakelet, with a well-defined water horizon, and perhaps five or six miles wide; then narrowing again, it moves quietly on about forty miles till it reaches Murchison's Cataracts. After a turbulent course of thirty miles, it emerges from the cataracts, a peaceful river capable of carrying a large steamer through the remaining 112 miles of its deep channel, and joins the Zambesi in lat. 17 deg. 47 min. S., 100 miles from the confluence of that river with the sea. The valley through which the Shiré flows is from ten to twelve miles broad at the southern extremity of lake Nyassa, but soon stretches out to twenty or thirty miles, and is bounded all the way on both sides by ranges of hills, the eastern range being remarkably lofty. At Chibisas (lat. 16 deg. 2 min. 3 sec. S., 35 deg. 1 min. E.), a few miles below the cataracts, the range of hills on the left bank of the Shiré is not above three miles from the river, while the other range has receded out of sight. If from Chibisas we proceed in a north-easterly path, a three hours' march places us on an elevation of upwards of a thousand feet. This is not far from the level of the Upper Shiré valley (1,200 feet), and appears to be its prolongation. Four hours' additional travel, and we reach another plateau, a thousand feet higher, and in a few hours more the highest plateau, 3,000 feet above the level of the sea, is attained, and we are on an extensive table-land, which, in these three distinct divisions, extends to Zomba (lat. of southern end 15 deg. 21 min. S.). It is then broken; and natives report that, north of Zomba, which is twenty miles in length from N. to S., there is but a narrow partition between the lakes Nyassa and Tamandua (Shirwa). Three islands were visible on the west side of what we could see of Nyassa from its southern end. The two ranges of hills stretch along its shores, and we could see looming through the haze caused by burning grass all over the country, the dim outlines of some lofty mountains behind the eastern hills. On the table-land are numerous hills and some mountains, as Chicadgura, perhaps 5,000 feet high, and Zomba (which was ascended), from 7,000 to 8,000 in altitude. From this table-land we can see, on the east of lake Tamandua, the Milanje mountains, apparently higher than Zomba and mount Clarendon, not unworthy of the noble name it bears. All this region is remarkably well watered; wonderfully numerous are the streams and mountain rills of clear, cool, gushing water. Once we passed eight of them and a strong spring in a single hour, and we were then at the end of the dry season. Even Zomba has a river about twenty yards wide, flowing through a rich valley near its summit. The hill is well wooded also; trees, admirable for their height and the amount of timber in them, abound along the banks of the streams. "Is this country good for cattle?" the head man of the Makololo, whose business had been the charge of cattle, was asked. "Truly," replied he; "don't you see the abundance of such and such grasses, which cattle love, and on which they grow fat?" And yet, the people have only a few goats, and still fewer sheep. There are no wild animals in the highlands, and but few birds; and with the exception of one place, where we saw some elephants, buffaloes, &c., there are none on the plains of the Upper Shiré, but the birds, new and strange, are pretty numerous. In the upper part of the Lower Shiré, in the highlands, and in the valley of the upper Shiré, there is a somewhat numerous population. The people generally live in villages and in hamlets near them. Each village has its its own chief, and the chiefs in a given territory have a head chief, to whom they owe some sort of allegiance. The paramount chief of one portion of the Upper Shiré is a woman, who lives two days' journey from the west side of the river, and possesses cattle. The chief has a good deal of authority; he can stop trade till he has sold his own things. One or two insisted on seeing what their people got for the provisions sold to us. The women drop on their knees when he passes them. Mongazi's wife went down on her knees when he handed her our present to carry into the hut. One evening a Makololo fired his musket without leave, received a scolding, and had his powder taken from him. "If he were my man," said the chief, "I would fine him a fowl also." The sites of their villages are selected, for the most part, with judgment and good taste. A stream or spring is near, and pleasant shade-trees grow in and around the place. Nearly every village is surrounded by a thick high hedge of the poisonous Euphorbia. During the greater part of the year the inhabitants could see an enemy through the hedge, while he would find it a difficult matter to see them. By shooting their already poisoned arrows through the tender branches, they get smeared with the poisonous milky juice, and inflict most painful if not fatal wounds. The constant dripping of the juice from the bruised branches prevents the enemy from attempting to force his way through the hedge, as it destroys the eyesight. The huts are larger, stronger built, with higher and more graceful roofs than any we have seen on the Zambesi. The Boabab (spreading place) is at one side of the village; the ground is made smooth and level, and the banians, the favourite trees, throw a grateful shade over it. Here the people meet to smoke tobacco and *bang;* to sing, dance, beat drums, and drink beer. (In the Boabab of one small village we counted fourteen drums of various sizes, all carefully arranged on dry grass.) Some useful work, too, is performed in this place, as spinning, weaving, making baskets and fish-nets. On entering a village, we proceeded at once to the Boabab, on which the Strangers' hut is built, and sat down. Large mats of split bamboo are politely brought to us to recline on. Our guides tell some of the people who we are, how we have behaved ourselves since they knew us, where we are going, and what our object is. This word is carried to the chief. If a sensible man, he comes as soon as he hears of our arrival; if timid or suspicious, he waits till he has thrown his dice, and given his warriors, for whom he has sent in hot haste, time to assemble. When the chief makes his appearance, his people begin to clap their hands, and continue clapping until he sits down; then his councillors take their places beside him, with whom he converses for a minute or so. Our guides sit down opposite them. A most novel scene now transpires: both parties, looking earnestly at each other, pronounce a word, as "Amhinatu" (our chief or father), then a clap of the hands from each one—another word, two claps—a third word, three claps—and this time all touch the ground with their closed hands. Next, all rise, clapping—sit down again, and—clap, clap, clap—allowing the sound gradually to die away. They keep time in this most perfectly, the chief taking the lead. The guides now tell the chief all they please, and retire, clapping the hands gently, or with one hand on the breast; and his own people do the same, when they pass the chief, in retiring. The customary presents are exchanged, after a little conversation with the chief, and in a short time his people bring provisions for sale. In some villages the people clapped with all their might when they approved what the chief was saying to us. In others, the clapping seems omitted in our case, though we could see it was kept with black strangers who came into the village. The chief at the lake, an old man, came to see us of his own accord—said he had heard that we had come, and sat down under a tree—and he came to invite us to take up our quarters with him. Many of the men are very intelligent-looking, with high foreheads and well-shaped heads. They show singular taste in the astonishingly varied styles in which their hair is arranged. Their bead necklaces are really pretty specimens of work. Many have the upper and middle as well as the lower part of the ear bored, and have from three to five rings in each ear. The hole in the lobe of the ear is large enough to admit one's finger, and some wear a piece of bamboo about an inch long in it. Brass and iron bracelets, elaborately figured, are seen; and some of the men sport from two to eight brass rings on each finger, and even the thumbs are not spared. They wear copper, brass, and iron rings on their legs and arms; many have their front teeth notched, and some file them till they resemble the teeth of a saw. The upper lip ring of the women gives them a revolting appearance; it is universally worn in the highlands. A puncture is made high up in the lip, and it is gradually enlarged until the pelelé can be inserted. Some are very large. One we measured caused the lip to project two inches beyond the tip of the nose; when the lady smiled the contraction of the muscles elevated it over the eyes. "Why do the women wear these things?" the venerable chief, Chinsundi, was asked. Evidently surprised at such a stupid question, he replied, "For beauty! They are the only beautiful things women have; men have beards, women have none. What kind of a person would she be without the pelelé. She would not be a woman at all with a mouth like a man, but no beard." One woman having a large tin pelelé with a bottom like a dish, refused to sell it, because, she said her husband would beat her if she went home without it. These rings are made of bamboo, of iron, or of tin. Their scanty clothing—the prepared bark of trees, the skina of animals (chiefly goats), and a thick strong cotton cloth, are all of native manufacture. They seem to be an industrious race. Iron is dug out of the hills, and every village has one or two smelting-houses; and from their own native iron they make excellent hoes, axes, spears, knives, arrow-heads, &c. They make, also, round baskets of various sizes and earthen pots, which they ornament with plumbago, said to be found in the Hill Country, though we could not learn exactly where, nor in what quantities: the only specimen we obtained was not pure. At every fishing village on the banks of the river Shiré men were busy spinning buaze and making large fishing nets from it; and from Chibisas to the lake, in every village almost, we saw men cleaning and spinning cotton, while others were weaving it into strong cloth in looms of the simplest construction, all the processes being excessively slow. This is a great cotton-growing country. The cotton is of two kinds, "Tonji manga," or foreign cotton, and "Tonji cadji," or native cotton. The former is of good quality, with a staple from three-quarters to an inch in length. It is perennial, requiring to be re-planted only once in three years. The native cotton is planted every year in the highlands, is of short staple, and feels more like wool than cotton. Every family appears to own a cotton patch, which is kept clear of weeds and grass. We saw the foreign growing at the Lake and in various places for thirty miles south of it, and about an equal number of miles below the cataracts on the Lower Shiré. Although the native cotton requires to be planted annually in the highlands, the people prefer it, because, they say, "it makes the stronger cloth." It was remarked to a number of intelligent natives near the Shiré lakelet, "you should plant plenty of cotton, and perhaps the English will come soon and buy it."—"Surely the country is full of cotton," said an elderly man, who was a trader and travelled much. Our own observations convinced us of the truth of this statement. Everywhere we saw it. Cotton patches of from two to three acres were seen abreast of the cataracts during the first trip, when lake Tamandua was discovered, though in this journey, on a different route, none were observed of more than half-an-acre. They usually contained about a quarter of an acre each. There are extensive tracts on the level plains of both the Lower and Upper Shiré, where salt exudes from the soil. Sea island cotton might grow well there, as on these the foreign cotton becomes longer in the staple. The cotton-growers here never have their crops cut off by frosts. There are none. Both kinds of cotton require but little labour, none of that severe and killing toil requisite in the United States. The people are great cultivators of the soil, and it repays them well. All the inhabitants of a village, men, women, and children, and dogs, turn out at times to labour in the fields. The chief told us all his people were out hoeing, and we saw in other parts many busy at work. If a new piece of ground is to be cultivated, the labourer grasps as much of the tall dry grass as he conveniently can, ties it into a knot at the top, strikes his hoe through the roots, detaching them from the ground with some earth still adhering which, with the knot, keeps the grass in a standing position. He proceeds in this way over the field. When this work is finished, the field exhibits a harvest-like appearance, being thickly dotted all over with these shocks, which are three feet high. A short time before the rains, several of these shocks are thrown together, the earth scraped over them, and then the grass underneath is set on fire. The soil is thus treated in a manner similar to that practised in modern times among ourselves on some lands. When they wish to clear a piece of woodland, they proceed in precisely the same way as the farmers in Canada and the Western States do—cut the trees down with their axes, and leaving the stumps about three feet high standing, pile up the logs and branches for burning. They grow lassaver in large quantities, preparing ridges for it from three to four feet wide, and about a foot high. They also raise maize, rice, two kinds of millet, beans, sugar-cane, sweet potatoes, yams, ground-nuts, pumpkin, tobacco, and Indian hemp. Near lake Nyassa we saw indigo seven feet high. Large quantities of beer are made, and they like it well. We found whole villages on the spree, and saw the stupid type of drunkenness, the silly sort, the boisterous talkative sort, and on one occasion the almost up-to-the-fighting-point variety, when a petty chief, with some of the people near, placed himself in front, exclaiming, "I stop this path; you must go back." Had he not got out of the way with greater speed than dignity, an incensed Makololo would have cured him of all desire to try a similar exploit in future. It was remarked by the oldest traveller in the party that he had not seen so much drunkenness during all the years he had spent in Africa. The people, notwithstanding, attain to a great age. One is struck with the large number of old grey-headed persons in the highlands. This seems to indicate a healthy climate. For their long lives they are not in the least indebted to frequent ablutions. "Why do you wash yourselves? our men never do," said some women at Chinsurdi to the Makololo. An old man told us he remembered having washed himself once when a boy, but never repeated it; and from his appearance one could hardly call the truth of his statement in question. A fellow who volunteered some wild geographical information followed us about a dozen miles, and introduced us to the chief Moena Moezi by saying, "They have wandered; they don't know where they are going." "Scold that man," said a Makololo head to his factotum, who immediately commenced an extemporary scolding: yet the singular geographer would follow us, and we could not get quit of him till the Makololo threatened to take him to the river and wash him. The castor-oil with which they lubricate themselves and the dirt serve as additional clothing, and to wash themselves is like throwing away the only upper garment they possess. They feel cold and uncomfortable after a wash. We observed several persons marked by the small pox. On asking the Chief Mongazi—who was a little tipsy, and disposed to be very gracious—if he knew its origin, whether it had come to them from the sea, "He did not know," he said, "but supposed it must have come to them from the English." Like other Africans, they are somewhat superstitious. A person accused of bewitching another and causing his death, either volunteers or is compelled to drink the Maiori or ordeal. On our way to the lake a chief kindly led us past the next two villages, whose chiefs had just been killed by drinking the Maiori. When a chief dies his people imagine that they may plunder any stranger coming into their village. A chief, near Zomba, at whose village we took breakfast on our way up, drank the Maiori before our return, and vomited, was therefore innocent. His people we found manifesting their joy by singing, dancing, and beating drums. Even Chibisa, an intelligent and powerful chief, drank it once, and when insisting that all his numerous wars were just, that his enemies were always in the wrong, said to us, "If you doubt my word, I am ready to drink the Maiori." On the evening of the day we reached Moena Moezi, an alligator carried off his principal wife from the very spot where some of us had washed but a few hours before. We learned on our return that he had sent messengers to several villages, saying "He did not know whether we had put medicine on the spot, but after we had been there his wife was carried off by an alligator." The first village refused to sell us food, would have nothing whatever to do with us, and the chief of the next village, who happened to be reclining in the Boabab, ran off, leaving his wooden pillow and mat behind. The women seldom run away—having more pluck perhaps than the men. When a person dies, the women commence the death wail, and keep it up for two days. A few words are chanted in a plaintive voice, ending by a prolonged note: *a—a*, or *o—o*, or *ea, ea, e—a*. The corpse is buried in the same hut in which he dies. It is then closed up and allowed to fall into decay. We found one village in mourning, on the banks of the Upper Shiré. The chief's father had died some time previous. They had not washed themselves since, though washing is practised more or less on these plains, and they would not wash until some friends at a distance, who possessed muskets, had come and fired over the grave. The badge of mourning consists of narrow strips of Palmyra leaf, tied round the head and arms, some times round head, neck, breast, knees, ankles, arms, and wrists. They have the idea of a Supreme Being, whom they name Pambé, and also of a future state. The Chief Chinsurdi said they all knew that they lived again after death. "Sometimes the dead came back again—they appeared to them in dreams, but they never told them where they had gone to." This is an inviting field for benevolent enterprise. There are thousands needing Christian instruction, and here are materials for lawful commerce, and a fine healthy country, with none of the noxious insects with which Captains Burton and Speke were tormented, and, with the single exception of thirty miles, water communication all the way to England. Let but a market be opened for the purchase of their cotton, and they can raise almost any amount of it, and the slave trade will speedily be abolished.

"On his proposed journey from Khartum in Upper Egypt to meet Captain Speke, on or near the Lake Nyanza of Central Africa," by Mr. Consul Petherick.

"On the excavations on the site of the Roman City at Uriconium, at Wroxeter," by Mr. T. Wright.

"On the mountain districts of China, and their aboriginal inhabitants," by Mr. W. Lockhart.

"History of the ante-Christian settlement of the Jews in China," by Dr. Macgowan, U. S.

"On the geographical distribution of plants in Asia Minor," by M. Pierre de Tchihatchef.

"On the aborigines of the arctic and sub-arctic regions of North America," by Dr. Rae.

"On the course and results of the British North American exploring expedition, under his command in the years 1857-8-9," by Captain J. Palliser.

"On the tribes composing the population of Morocco," by Lieut. E. Schlagintweit.

"On certain remarkable deviations in the stature of Europeans," by Mr. R. Cull.

"On the Aryan or Indo-Germanic theory of races," by Mr. J. Crawfurd.

"On the geography of the proposed communication between England and America, via the Faroës, Iceland, and Greenland," by Col. Shaffner.

"On a deep sea pressure gauge, invented by Henry Johnson," by the Rev. Dr. Booth.

"On the proposed communication between the Atlantic and Pacific, via British North America," by Capt. M. H. Synge, R.E.

"A new map of the interior of the northern island of New Zealand, constructed during an inland journey in 1859," by Prof. F. Von Hochstetter (Vienna), Geologist of the Austrian Novara Expedition.

"On certain ethnological boulders, and their probable origin," by the Rev. Dr. Hincks.

"On the existence of a true plural of a personal pronoun in a living European language," by Mr. R. Cull.

"On the manufacture of stone hatchets and other implements by the Esquimaux, illustrated by native tools, arrow heads, &c.," by Captain Sir E. Belcher, R.N.

"On the antiquity of the human race," by Dr. J. Hunt.

"On the caravan routes from the Russian frontier to Khiva, Bokhara, Kokham, and Yarkand, with suggestions for opening up a trade between Central Asia and India," by Mr. T. W. Aitkinson.

"On a set of relief models of the Alps, &c., by Capt. Cyhulz (Imperial Austrian Artillery).

The author desires to introduce to the notice of this meeting, a set of models, intended to facilitate instruction in the manner of delineating the features of the ground on topographical maps, and lately introduced into the technical schools of Austria. It is the first aim of the author to lead the pupil, by means of these models, to a correct understanding or appreciation of *form*, as the only way of producing a first-rate topographical draughtsman. Instead, therefore, of setting him to imitate drawings from paper, his studies and copies will be made from models, and, at a more advanced stage, from nature itself. These models represent, firstly, inclined planes or slopes, separate, in combinations, or intersecting each other. It is from these the pupil acquires the first idea of the principle upon which depends a correct delineation of the ground. Secondly, we have three models which represent the most characteristic and most widely distributed features of the ground. Having acquired from the preceeding, a thorough knowledge of fundamental principles, the pupil will proceed to delineate upon paper the following models. These represent firstly, an undulating country; secondly, a plateau formation, with deeply-cut valleys; thirdly and fourthly, some mountainous tracts. Contour lines have been laid down upon the whole of these models with mathematical accuracy. The horizontal projection of some of the most difficult sections has also been added, to illustrate the manner of filling up the contour lines and laying down auxilliary contours. It has not, however, been thought advisable to do more, as otherwise the pupils would avail themselves of these facilities to too great an extent. A small instrument for measuring the gradients, and a scale showing the intensity of the shading (*hachorres*) for various degrees of acclivity, are to be made use of in copying the models. The author believes that the use of models, judiciously selected, will engage the pupil's uninterrupted attention; he will overcome mechanical difficulties with greater facility, and will not be so wearied as by the tedious, in reality, useless attempts to copy a topographical drawing placed before him. The author would add that his models have been made of galvano-plastic copper, and are therefore not so liable to breakage as plaster of Paris models.

"On the origin of the arts, and the influence of race in their development," by Mr. R. Knox.

"On the caravan route from Yarkand to Maima-tchin, with a short account of this town, through which the trade is carried on between Russia and China," by Mr. T. W. Aitkinson.

"On alphabets, and especially the English; and on a new method of marking the sound of English words, without change of orthography," by Professor Jarrett.

"On the Jaezwings, a population of the thirteenth century, on the frontiers of Prussia and Lithuania," by Mr. R. G. Latham.

"On the arrangement of the forts and dwelling places of the ancient Irish," by the Rev. Professor Graves.

"A brief account of the progress of the works of the Isthmus of Suez canal," by Mr. D. A. Lange.

"On the formation of icebergs and their action, as observed in the Hudson's Bay and Straits," by Dr. J. Rae.

"On the geographical distribution and trade in the Cinchona," by Mr. V. Hurtado.

The different species of the tree which yields the bark known in commerce as Peruvian bark, and from which the sulphate of quinine is obtained, grow on the slopes of the Andes, at a height which varies according to the latitude and the topographical situation of the mountains where this precious vegetable production has been found. In New Grenada it grows on the central branch of the Cordillera, which extends from the province of Paito and separates the two valleys of the Cauca and Magdalena, being most abundant in the districts of Pitayó and Almagner. It is also found on the mountains above Finagamga, near Bogotá. The Pitayó bark has been the richest in quinine; and as in that locality the cuttings have been carried on to the greatest extent, the article is nearly exhausted. The same may be said of the Finagamga variety, which, although not so rich as the Pitayó, is prized on account of its being of easier labour. The Almagner bark, which at first was hardly saleable, is now used to a great extent in Philadelphia and London, on account of the scarcity of the two former species. The best bark is found on the Pitayó mountain, at a height of from 8000 to 11,000 feet above the level of the sea. The tree grows among the numerous species of Alpine vegetation which cover those mountains with thick forests, either in clusters or scattered about. For that reason it varies in size. Like all trees of a cold climate, it is of slow growth, and requires a great many years to arrive at a good height. Some of them have been found so large as to yield forty *arrobas* of green bark, which, when dried up, is reduced to about a third of its weight. Others only produce about ten *arrobas*. As this tree is chiefly found in wild, cold, uninhabited mountains, constantly covered by clouds, there has been no system in cutting, nor any study made to ascertain how long a spot should be left at rest before undertaking new cuttings. All that I am aware of is that the roots produce a great many shoots after a tree is cut down, and that these require about fifty years to become of a middling size. Young trees are also found growing from seeds. The nature of the soil seems to determine the qualities of the alkalies contained in the bark, quinine being most adundant in Pitayó, and cinchonine in Almagner. But rocky mountains and ravines are the spots where nature has placed this vegetable species. A remarkable circumstance is, that I am not aware that any bark trees should have been found on the western Cordillera, which separates the valley of Cauca from the Pacific coast, which ridge never attains the elevation of perpetual snow in those latitudes. It only remains for me to state, that the price of good sound Pitayó bark, which had gone down in London to 1s. 8d. per pound, is now as high as 2s. 6d., and some very inferior lots have been sold at 3s. The Almagner sort, which was entirely neglected two years ago, is now accepted by manufacturers at from 1s. to 1s. 4d. per pound. I make no mention of the Bolivian bark, the most esteemed in commerce, as I am not personally acquainted with that trade."

"Remarks on some of the races of India and High Asia (in connection with casts exhibited)" by M. R. von Schlagintweit.

"Cruise in the gulf of Pe-che-li and Leo-tung (China)," by Mr. J. Mickie.

"Journey in the Yoruba and Nupe countries," by Mr. D. May, R.N.

Section F.—Economic Science and Statistics.

"On the systems of poor law medical relief," by Mr. F. Purdy.

"On the physiological as well as psychological limit to mental labour," by Mr. E. Chadwick, C.B.

"Dr. Whewell on the method of political economy," by Mr. H. Fawcett, M.A., F. Trinity Hall, Cambridge.

"On the true principles of an income tax," by the Rev. J. Booth, LL.D.

"Notes on various efforts to improve the domiciliary condition of the labouring classes," by Mr. H. Roberts, F.S.A.

"On co-operative societies, their social and political aspect," by H. Fawcett.

"On some suggested schemes of taxation, and the difficulties of them," by Mr. W. Newmarch.

"On the economical results of military drill in popular schools," by Mr. E. Chadwick, C.B.

"On serfdom in Russia," by Dr. Michelsen.

"On the province of the statistician," by Mr. J. J. Fox.

"On local taxation for local purposes," by Mr. R. Dowden.

"Statistics of schools for neglected children," by Miss Carpenter.

"On sanitary drainage of towns," by Mr. J. Hitchman.

"On the system of taxation prevailing in the United States," by Mr. E. Jarvis, (Boston, U.S.)

"Some hints for the building of cottages for agricultural labourers," by Mr. H. J. Kerr, Porter.

"On the statistics of the herring fishery on the British coasts," by Mr. J. M. Mitchell.

MONTHLY NOTES.

MARINE MEMORANDA.

On the 23rd ult. the Peninsular and Oriental Company's paddlewheel steamship *Euxine* was taken to Stokes Bay for an official trial at the measured mile. The average of the four runs was 12·135 knots; revolutions, 21; steam, 18 lb.; vacuum, 22; temperature of superheated steam, 293 deg.; indicated horse-power, 1,468; draught of water, fore and aft, 13 ft. 3 in.; weight of coals, stores, water, ballast, &c., 360 tons. By a most extraordinary coincidence, the first and third runs of the *Ellora* on the previous day, and the first and third of the *Euxine* on this occasion, were all four exactly the same, viz., 4 min. 22 sec., or 13·740 knots per hour. The speed of the ship was greater than she has ever before attained; this has been effected by extensive alterations and improvements, new boilers, and the addition of a steam-superheating and a feed-heating apparatus. It blew very fresh all day, with frequent and heavy squalls of wind, notwithstanding which the engines kept up the speed of 21 revolutions without variation all day.

The Sociéte Cockerill of Antwerp, has just turned out a fine screw steamer, the *Congress*, of 2,000 tons. At her trial she accomplished $15\frac{3}{4}$ knots or fully 18 miles in the hour. She is a sister ship of the *Prince Albert*, of the Galway line, and is bark rigged, her dimensions being, length, 286 feet; beam, 38 feet; depth, 29 feet. She is propelled by two engines, with an aggregate of 400-horse-power. Her cylinders, of 60 inches diameter, are inverted; the length of stroke is four feet; and the screw, worked directly, is driven at 44 revolutions per minute. The screw, which is on Beattie's patent, being outside the rudder, has three blades, and is 18 feet in diameter, with a pitch of 34 feet. The saloon cabin is large enough to afford convenient accomodation for 60 persons, and, although at the stern of the ship, so easily did the screw work that scarcely any oscillation was perceptible in the swinging lamps with which the cabin is lighted. There is also an elegant state cabin, and the sleeping berths are of ample dimensions. The height of the spar deck is seven feet six inches, and of the 'tween deck, seven feet. The total number of steamers registered in the United Kingdom on the 1st of January, 1860, was 1863. a remarkably close approximation to the date of our era. The aggregate tonnage amounts to 666,513 tons.

The *Sirius* target-ship has been towed down Portsmouth harbour and berthed alongside the dockyard sheer jetty, where shipwrights are employed on her, working extra hours, affixing to her sides the three iron plates for shot experiments. An inspection of the interior of the *Sirius* affords abundant evidence of the terrific shaking the vessel's frame has received from the concussion caused by the shot striking the iron plates during the recent experiments in Porchester lake. Bolts are started along the greater portion of the ship's side, and one iron knee is broken clear through. At the back of the plates where they are fractured, but not penetrated by the shot, the broken plate has driven in timbers and all in a shattered mass before it. As this is the result of single shots on a frigate of the *Sirius's* scantling, it may reasonably be contended that concentrated firing from a frigate's 8-inch guns, at the same range, will be likely to produce equally disastrous effects even on a vessel of the solidity of the iron-cased frigates now constructing. Such damage to a vessel's side is irremediable at sea, and if near the water line, with any sea on, there is nothing to prevent the iron clad ship from filling and going down.

An official trial of the Peninsular and Oriental Company's screw steamship *Ellora*, previous to resuming her place in the mail service intrusted to this company, took place on the 22d ult., and was attended with a very satisfactory result. She left the docks at eleven o'clock, and proceeded to Stokes Bay. The *Ellora* was built by Messrs. J. Laird & Sons, of Birkenhead, in the year 1855, and the engines are by Messrs. George Rennie & Sons, of London. She was one of the four ships purchased of the French "Gaulthier Company" in 1858 by the Peninsular and Oriental Company, and has now had a thorough overhaul and refit of both engines and ship. She is fitted with Lamb and Summers's patent boilers, steam superheaters and feedwater superheaters, and also with Silver's marine governor. The working of the engines throughout the day elicited the greatest admiration. There was not a sign of hot bearings, and Messrs. Rennie & Sons, by the improvements and alterations they have effected in the engines, have obtained an increase in the speed of the ship amounting to nearly a knot per hour. The following are the results of the four runs at the measured mile:—Average speed, 12·791 knots; revolutions, 67; steam, 20 lb. to the square inch; vacuum gauge, 24; temperature of steam on the slide jacket, 340 deg. Her draught of water was 16 feet fore, and 17 feet 2 inches aft; weight of coal, water ballast, and spare gear on board, 536 tons. It was blowing nearly a gale of wind all day, with a strong tide running.

The *Sapphire*, just built by the firm of C. A. Day & Co., engineers and iron shipbuilders, Northam Works, Southampton, for the Southampton and Isle of Wight Steam Packet Company, made her trial trip on the 17th ult. The *Sapphire* left the Royal Pier at 9.51, and reached Cowes at 10.45, thus performing the voyage against tide in 54 minutes, and after embarking a few friends, proceeded to Ryde, which place was reached at 11.23. Here an excellent opportunity of testing her relative powers occurred, as the *Emerald* left Ryde Pier at the same moment as the *Sapphire*, and to the great satisfaction of all interested in the latter vessel, she beat her competitor by fully one-third between Ryde and Portsmouth, the *Sapphire* reaching the latter port at 11.23, thus making the run, including the stoppage at Cowes, in 1 hour and 32 minutes. The *Sapphire's* length is 120ft., beam 14ft. 6in., depth 8ft. $1\frac{1}{2}$in., tonnage, O.M., 125. The engines, which are on the oscillating principle, were made also by Messrs. Day & Co., and are nominally of 40-horse power, but on the trial worked up to 200-horse power, with perfect ease. The cylinders are 27 inches diameter, with 3ft. stroke; the paddle-wheels are feathered, and are 13ft. 6in. in diameter, and on the trial from 46 to 48 revolutions were made per minute, and an average speed of $12\frac{1}{4}$ knots per hour, and this with a strong head wind and against tide, and steam blowing off freely all the time. The boiler is fitted with Lamb and Summers's patent flues and superheating apparatus, raising the steam to 340 degrees of temperature.

The *Oneida*, the property of the Royal Mail Steam Packet Company, was taken out of the dock, Aug. 23, under the command of Capt. T. A. Bevis, for the purpose of testing the value and efficiency of the extensive alterations and improvements which have been lately made in her machinery. The *Oneida* arrived from her last voyage, with the mails from the Brazils and River Plate, on the 1st of June, four days before the mails were due, when, as is usual, a most severe examination of the machinery was made; and although no immediate necessity existed, yet to guard against even the remote possibility of a difficulty arising through an accident to the engines, it was determined to take out the shaft, and replace it with another coated with brass, which has been found in practice to resist oxidation and the inconvenience resulting therefrom, so common to those which have hitherto been used; and to remove the old propeller, and supply its place with one on Griffiths' well-known patent principle. These alterations were at once put in hand, and have occupied nearly three months in carrying out; the castings have been very successfully made by Messrs. Summers & Day, of Northam, and the whole of the other part of the alterations and fittings have been done at the company's factory here. The stern bearings of the shaft have been fitted on the principle of a combination of *lignum vitæ* sunk in brass, which engineers are of opinion will work better than the old style of bearings. On starting from the dock the ship had on board coals and fresh water to the weight of nearly 750 tons, and her immersion was 16ft. 9in. forward, and 19ft. aft. She steamed at a rapid pace down the river to Calshot and round the Bramble buoy, and from thence past the Warner and Bembridge Lights, proceeding outside the east end of the Isle of Wight; but as a very stiff wind was blowing and a heavy sea running, it was considered a sufficient trial had been accomplished, and the signal was given to return. On reaching the measured mile, the wind had considerably freshened, and was blowing on her beam with great force, but the mile was run in 5 min. 13 sec., giving a rate of 11·538 knots. Another run was made against a strong tide, with a little more than the same results, the average of the two runs being 11·875 knots per hour; the engines were working at 19lb. to the square inch, and making 26 revolutions per minute.

The experimental practice from the *Stork* gunboat upon Jones's angular target, representing his system of angulated ships' sides plated with iron or steel, commenced at Portsmouth on the 4th ult., under the superintendence of Captain R. S. Hewlett, C.B., commanding her Majesty's ship *Excellent*, the gunnery ship at the port. Mr. Jones is a practical iron and steel plate shipbuilder in Liverpool, and in his yard the target which represents his system has been constructed at his own expense, a very considerable sum, and under his immediate supervision. Mr. Jones's invention has for its object the construction of ships of war which are required to be shot-proof. To attain this object he proposes the sides of the ship should incline outwards from below the water line until they rise to the water line, and that from thence they should incline inwards at an angle of about 45 deg. This angle may be altered as experience may suggest. It will be seen that a vessel constructed on this plan will be of considerably greater beam at the water-line than on the upper deck, and will be nearer in form to the *Spartiate*, and other ships of her class, built by the French many years back, than any modern creations. The target experimented upon on Saturday represented the section of a ship's side constructed on this principle. Its face measured thirteen feet by nearly nine feet, and was covered with four armour plates, placed side by side. No. 1 plate was of 4½-inch soft steel; No. 2 was of the same material, but of 3½-inch; No. 3 and No. 4 plates were of 4½-inch iron of two different manufactures. The sectional portion of the target which supported the plates in their position was of great strength, but is stated to be of only half the actual strength which would be given in constructing a vessel on this plan, or as compared with the support given to her plates by the teak sides of the *Warrior*. The target was finally put together in Portsmouth dockyard by Mr. Jones's workmen, and weighs altogether nearly 20 tons. The old Arctic brig *Griper*, which was ordered to be broken up, was cut down to her main deck, and on it the target was secured. On Saturday morning it was taken up the harbour and moored alongside the *Sirius* target ship, the *Stork* gunboat being also moored head and stern at 200 yard's distance. Captain Hewlett arrived on board the *Stork* shortly before high water, and the experimental firing soon after commenced. The target had been painted white, and each plate divided into eight equal compartments, making thirty-two in the whole, and numbered round the margin. The *Stork's* aftermost 8-inch smooth-bore gun was the one used with solid 68-pound shot and a charge of 16 lb. of powder, calculated to penetrate under the same circumstances of range, &c., twelve feet of oak. The first shot fired struck the midship iron plate about two-thirds of the way down. The second struck the same plate near its centre. The third struck the junction of the two iron plates in a line with the first shot. The fourth was a miss, as far as the iron plates were concerned, it striking the heavy balks of timber at the foot of the target, and sending up a shower of splinters. The fifth shot struck the upper portion of the midship iron plate, the shot being shattered and portions of its fragments carrying away the frigate's rail immediately over it. No. 6, 7, 8, and 9 all struck parts of the same plate, which had been hit by former shots. There was an evident intention to test the principle of the target to the very utmost, seven out of the nine shots fired having been directed upon one plate, and four out of the seven being a repetition of blows on the same spot. The result of this severe test, as far as the iron plates are concerned, must be of the most satisfactory nature to the patentee, as proving the soundness of the principle of his invention. The plates have been indented to a certain extent, but in no place have they been pierced or fractured by the shot. This is the true principle of the target, and what is professed by the patentee,—to cause the shot to glance off without piercing or fracturing seriously the protecting plate. The trial is, as yet, the most successful instance of the resistance of iron plates to solid 68 lb. shot at so short a range, and affords a remarkable contrast to other recent trials on the targets affixed to the broadside of the *Sirius*, which were easily pierced from the same gun which has been used on Jones's target, and at the same range.

The Irish Channel Steamers.—The new steamer *Leinster* was recently engaged specially for the conveyance of the Lords of the Admiralty from Holyhead to Dublin. Steam was got up at 10 A.M., and shortly before 11 his Grace the Duke of Somerset (first Lord), Admiral Eden, Admiral Pelham, and Mr. Whitbread, attended by Messrs. West, Spalding, and King, secretaries, went on board, when the Admiralty flag was hoisted at the main. At 17 minutes past 11 o'clock the *Leinster* started from Holyhead, and in five minutes after she was going a-head, full speed for Kingstown against a stiff breeze from S.S.W. On her course over, her speed reached 24 miles an hour. As she "slowed" and rounded the East Pier light, at 40 minutes past 2, their Lordships' flag was saluted by a salvo of 19 guns from her Majesty's ship *Ajax*, and the *Leinster* was brought admirably alongside the Carlisle Pier, under the able direction of Captain John Williams. The *Leinster* made the run from "light to light" in three hours and 23 minutes. Their Lordships expressed the highest opinion of the ship as they were taking their departure for town. Prior to their Lordships proceeding to town, they inspected the naval depot, in charge of district-carpenter Hartley; the Customs' station, in charge of Mr. Taylor; and the Coastguard station, in charge of Lieutenant Foster, R.N.

Ward's Marine Signals.—Mr. W. H. Ward's marine signals were recently subjected to the final experimental tests at Woolwich, preparatory to their being received on board the ships of the fleet at Portsmouth, whither they are now to be dispatched with the approbation of the Board of Admiralty, so as to undergo a more extended course of trial over various ranges from ship to ship at sea. The trials commenced on board the flagship *Fisgard*, under the personal supervision of Commodore the Hon. James R. Drummond, C.B., aide-de-camp to Her Majesty, and Superintendent of the Dockyard, who for some time past has taken considerable pains in improving the present imperfect mode of signals, and has consequently encouraged with more than ordinary interest the invention of Mr. Ward, to whom he has suggested alterations and additions, varying from the original system proposed about 18 months ago, and which have been adopted with marked advantage in simplifying the system and adding to its general improvement and facility of action. Commodore Drummond made an interesting trial of the night telegraph, without lights. Four of the lanterns, forming a complete numerical, or cypher and alphabetical code, suspended in a vertical line, telegraphed a course of signals, which were rendered visible at a short distance only, and after nightfall a succession of sentences were transmitted from ship to shore, and replied to, a small apparatus, on the same principle, having been provided for the purpose on shore, and which is intended for the use of gunboats and ships of small burthen. The experiments were exceedingly satisfactory, and the invention was hailed by officers and men as likely to be productive of incalculable benefit to the seafaring world at large. A number of Mr. Ward's signal flags recently adopted by the navy were also exposed in one of the sheds of the yard, for the purpose of displaying their effect in a drooping position. The flags are made in pennant form, and possess the advantage of being distinguished in all positions, whether extended by the breeze or drooping in a calm. In the position yesterday the various hues embracing the colours of the rainbow were clearly discerned. The flags are of three sizes, and half their length is their greatest width. The whole is ordered to be packed and forwarded to Portsmouth.

British Fisheries.—The annual report of the Commissioners for the British Fisheries has been presented to Parliament. This is a very important branch of industry; in the year 1859, 12,802 boats, manned by 43,062 fishermen and boys, were employed in the herring, cod, and ling fisheries, and the estimated value of the boats, nets, and lines is £739,096; besides which, these fisheries also furnished employment to 9,267 seamen, and no less than 49,022 other persons, making a total of 101,351, independently of 927 seamen in foreign boats. The herring fishery was remarkably short in its produce on the east coast, and the quantity cured has not been so small in any year since 1837. No cause can be assigned for such fluctuations in the take, but it is hoped that the time is not far distant when the migrations of the fish will be explained. The quantity of herrings cured during the year was 491,487 barrels, branded 158,676, exported 272,979; the quantity cured was 117,488 barrels less than the average of the three preceding years—a very great falling off. Of the export 203,349 barrels went to the Continent, 68,882 to Ireland, and 748 to the colonies. The branding is voluntary, and a fee is now charged for it, but eminent foreign houses prefer to carry on their dealings by it, and nearly one-third of the whole quantity cured was presented for branding, the fees realizing £2,644. The estimate taken by the Commissioners of Inquiry of the cost of branding was £3,380, and, if the fishing had proved equal to that of last year, the amount would have been realized. This is the first year of the fee, and the proportion branded is equal to the average brandings of the previous 12 years, when the branding was given gratis, so that the imposition of the fee has not affected the demand for the brand. In the cod and ling department the year's returns show an increase; 118,383 cwt. were cured dried, and 5,362 barrels in pickle, and the quantity exported was 35,923 cwt. cured dried. The extensive improvements at Dunbar are proceeding successfully; such is the stormy character of the coast, that though the new sea wall is 22 feet above the level of high water at spring tides, yet, in bad weather the spray frequently rises upwards of 50 feet above the cope of the wall. The report enters at some length into the disputes respecting trawling for herrings, which is prohibited, but the prohibition is too indiscriminate and difficult to be enforced. The Lord-Advocate has been passing a bill through Parliament upon the subject. Of the intellectual condition of the fishermen and their families a very unfavourable account is given by Mr. Middleton, inspector of schools, in his report this year upon the north-eastern division of Scotland. He expresses his belief that the average school attendance of fishermen's children, when they do attend school, is not more than three months in the year. The conditions of existence among this class of our countrymen, he says, do not require much aid from the schoolmaster; and their migratory habits, caused by the herring fishing drawing them (often with their whole families) from their villages to a few central points for three months in summer, together with the limited ideas and limited earthly hopes of the parents, their continual struggle with the inconstant sea, which necessitates the labour of old and young in fine weather, the feast in prosperity, the fast in adversity, combine to cause such neglect of schooling as is equalled in none other of the industrial classes. They are almost a distinct people everywhere, and nearly as exclusive in their marriages as the Jews; rarely is there an exception to the rule of fisherman to fisherwoman.

How New York Grows.—From the inquiries made with reference to the approaching census, the population of New York appears to have increased 33 per cent. It now numbers 900,000, to which, if the population of the suburb of the city be added, there will be a total of a million and a quarter, from which it appears that, outside China and Japan, New York is in population the third city in the world; and if its growth only still continues in the same ratio—as there is every reason to believe it will—this metropolis will soon be the first city in the world. Its growth is the measure of the growth of the country: while the United States grow, it will necessarily grow in the same proportion, and that growth is unprecedented in the history of the world.

The Manchester Association for the Prevention of Steam Boiler Explosions.—At the monthly meeting of the executive committee, held at the offices of the Association, 41 Corporation Street, Mr. H. W. Harman, C.E., chief inspector, presented his report, from which the following are extracts:—We have made 183 visits, examined 535 boilers, and 378 engines: of these seven visits have been special, 7 boilers specially, 23 internally, and 23 thoroughly examined; 25 cylinders have been indicated at ordinary visits, and 4 at special visits. The general defects are as under:—Fracture, 7 (one dangerous); corrosion, 17 (three dangerous); safety valves out of order, 35; water gauges ditto, 15 (three very defective); pressure gauges ditto, 9; feed apparatus ditto, 3; blow-off cocks ditto, 26; furnace out of shape, 18; deficiency of water 1; blistered plates, 5; total, 136 (4 dangerous); boilers without glass water gauges, 16; ditto pressure gauges, 18; ditto blow-off cocks, 15; ditto back pressure valves, 58. The remaining defects are not of sufficient importance to render particular remark necessary.

The Growth of Paris.—Since the late additions made to the city of Paris it covers a space of 78,020,000 yards. Of these 15,000 consists of gardens, or of waste ground laid out for building. By the census taken in the year 1856 the population is set down at 1,174,346 souls. At present it is calculated that in consequence of the limits being extended to the fortifications, the population of Paris amounts to 1,800,000.

Prevention of Rot in Dwelling Houses.—The following receipt has been found to answer well for this purpose:—Make two or more openings in the external walls, and put gratings on them to keep out vermin, from below the basement floor. Insert a tile pipe into the fire wall, with one end open to the space below the floor, and carry the pipe up the centre of the fire wall as close as possible to the fire-flue, and out at the chimney head. The air in the pipe will be rarified, being in close contact with the fire-flue, thus causing a continuous upward flow, sweeping the space below the floor of all the foul air, which is the chief cause of dry rot. The whole of the compartments in the house may be ventilated by means of this pipe, by inserting a tube into it at the level of the ceiling, with a valve in it to prevent down draught. An experience of ten years has afforded good proof of the success of the plan.

Kent, Sussex, and Northampton Iron.—In Kent, Sussex, and Northampton, the iron trade is about to receive an extension. Two companies are being organised near Faversham for the purpose of working the iron ore in the two former counties, and shipping it to the Tyne and the Tees for the use of the furnaces in this district. The vessels which bring the iron here will take coal back again, and the freights by these return cargoes will be eased. The coals taken will be coking and household, for both of which kinds a great demand has sprung up since the opening of the Mid Kent and East Kent Railways. The coking coals will be made into coke by the railway companies, and for the household coals a ready market will be found in the towns along the new lines, which will get them cheaper and easier by this route than by any other at present available. Messrs. Bell Brothers, of Middlesborough and Wylam, have tested the Kentish ore, found it of excellent quality, and expressed themselves ready to enter into a contract with the promoters of the company for purchasing a large quantity both for melting and forge purposes. The demand for the Northamptonshire iron-stone increases steadily, and the quality is found to improve. One Newcastle firm has recently tried it, and found it produced 40 per cent. of iron. This account shows that what we sometime ago said, as to Sussex as an iron field, was not far from the truth.

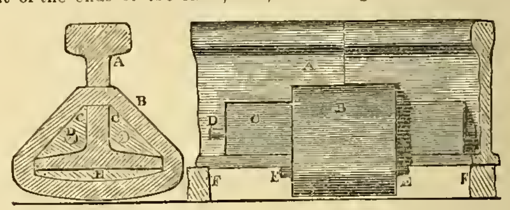
Oyster Breeding.—It is not very long since we noticed what we termed the "oyster manufacture" on the French coast. We have now to report the progress which has been made with this curious project. M. Coste, of the Institute, and several of the local authorities of the Cotes-du-Nord, went a short time ago in the *Chamois*, a Government vessel, to examine the oyster beds prepared by him in the bay of St. Brieuc. It is known that these beds are formed by depositing in the sea facines constructed of branches of trees covered with the spawn of oysters. Out of 300 of these facines, two selected by chance were raised, and each one was found to have upwards of 20,000 small oysters adhering to it; in addition to which a considerable number were, owing to the roughness of the sea, shaken off in the hoisting. These facines were only deposited in June last year. Near the bed of St. Marc, which was formed five years ago, a dredging machine was cast out, and in five minutes it pulled up upwards of 2,000 oysters in fine condition. These results prove that the experiments of M. Coste have perfectly succeeded; indeed they have surpassed the most sanguine expectation. The belief is that the bed of St. Marc must now consist of between 4,000,000 and 5,000,000 oysters, and the working of it is to commence next November. As promising a great extension of a most important trade in human food, this is very satisfactory.

M. Lenoir's New Motive Power.—An invention founded upon the simplest fact in science, being merely the application upon a large scale of one of the elementary experiments in chemistry—that of the synthesis of water in the radiometer—has recently been tried in Paris. The inventor has simply utilised the principle of the expausion of air when at a lower temperature, by means of combustion through the spark of induction of hydrogen. The economy produced is calculated at not less than 40 per cent. by the suppression of the boiler, the chimney, and the other accessories hitherto used in the construction of steam-engines. The machine itself is said to offer a saving of 30 per cent. Several engines, varying from five to ten horse power, constructed by Marinoni, have been despatched to England and Belgium. M. Hardouin has ordered one of 20-horse power, for the works hurrying on in the Isthmus of Suez. This new machine is about to be tried on some of the French railways. Until then it would be premature to pronounce the assertions made by the inventor and his friends as the results of proof. The practical love of conviction of the English in these matters requires some more solid evidence than that afforded by experiment alone, however grandly and royally conducted. At present we are sanguine as to the value of M. Lenoir's invention for fixed engines; we remain more than doubtful of its use as a motive power of sufficient force for railways or navigation. For agricultural purposes the portable steam engine is completely set aside by the invention, and for the long-sought problem of the machine carriage on common roads it will supersede all other inventions. As if the very air we breathe at this moment were pregnant with inventions of the kind, a carriage propelled by neither steam nor gas, but by the simplest screw imaginable, was beheld lately, for the first time, in the streets of Paris, going with such amazing swiftness as to leave far behind the four-in-hand carriages of the Jockey Club, which endeavoured in vain to keep up with it. The inventor is said to be a poor man, who has constructed the vehicle entirely himself.

The Late Augustus Welby Pugin.—A movement is on foot for raising a monument to the memory of the late Augustus Welby Pugin; and we are glad to hear that it is taking so practical and useful a form as to enable many to join in it who would, perhaps, not feel bound to help if the object were only a stained glass window or a statue to the memory of one who, though singularly gifted, enthusiastic, and energetic, nevertheless failed to leave behind him any work which can fairly be pronounced a great work of art for all time. Pugin died young; but the deed for which he really deserves credit is the stimulus his writings, even more than his buildings, gave to the revived study of mediæval architecture, sculpture, and painting. It is right, therefore, that any scheme, the object of which is to preserve and do honour to his memory before men, should take a form such as that which the proposition now assumes—namely, of a Travelling Studentship, (to which it is proposed to add a Medal,) generally analogous to those of the Royal Academy, but tenable only for travels in the United Kingdom, and for drawing its mediæval antiquities. This is the thing above all others to which young students of architecture ought to give their attention,—and, as far as we are able to judge from architectural exhibitions, just the point to which they seldom do attend. If there were a more earnest study of ancient architecture, we should have fewer blunders and fewer absurdities than now; and unless men study the old examples when they are young, it is notorious that they never do so at all. Such a memorial as that proposed, Pugin himself, we cannot doubt, would most approve; for he was ever earnest and willing to assist others in life, and could not but rejoice that his memory should also be serviceable to men, in aiding the study he most delighted in. It is one, moreover, which may be joined in by all lovers of our ancient architecture, however diverse may be the degrees of their estimates of the works of Pugin himself.

The Committee consists of upwards of seventy noblemen and gentlemen, the chairman being Mr. Beresford Hope, who is also joint treasurer with Mr. G. G. Scott. The honorary secretaries are Mr. Joseph Clarke, of 13 Stratford Place, and Mr. Talbot Bury, of 48 Welbeck Street, London.

Triangular Joint for Rails.—The accompanying engraving represents a triangular ring-joint, which has been in successful use for some time on portions of the Camden and Amboy Railroad between Philadelphia and New York. It is probable that this joint may furnish hints for further improvements, and, perhaps, lead to something superior to any of the joints and chairs now in use. It was devised by Mr. Edwin A. Stevens, Esq., who was for many years superintendent, and is now president of the road. Its construction is very simple, consisting merely of a continuous nearly triangular ring, R, of wrought iron, $3\frac{1}{4}$ inches wide, and $\frac{1}{2}$ inch thick. The top of this ring passes through a slot, S, cut out of the ends of the rails; and, after being fixed in its position, two



cast iron wedges, W, $7\frac{1}{2}$ inches long, and with a very slight taper, are driven between the sides of the ring and those of the rail. These wedges being liable to break are strengthened by rods, I, of wrought iron $\frac{3}{8}$ of an inch in diameter, and $8\frac{1}{2}$ inches long, inserted as a core when the wedges are cast. A thin wedge of plate iron is also driven in, under the rail. The joints are placed, not over but between the cross-ties; the distance apart of which is there diminished to about one foot in the clear. The triangular ring-joint is not altogether free from defects. Its wedges are apt to loosen and require re-driving. This is always the case where such wedges are used with rail chairs. This, however, is a consideration of but little importance; and the track men have found this joint to require much less attention than chairs with wedges. A more serious one is, that where the foundation on which the cross-ties rest is bad, and permits much unequal settlement, the increased strain thereby brought upon the ends of the rails and upon the ring-joints, occasions a tendency to split off a portion of the end of the rail either above or below the slot. This can be avoided only by careful attention to maintain the constant adjustment of the track. It has taken place to but a limited extent on the Camden and Amboy road, and fortunately is not attended by any danger to trains. The taking up of a rail and replacing it by another, with the ring-joint, is an operation of no more than the ordinary labour involved in the process of changing rails. The engines and trains pass over the joint very smoothly, without any perceptible jar or noise. With some simple device for preventing the loosening of the wedges, and the breaking of the rails, this joint would leave little to be desired. Perhaps the former might be attained by using wrought iron for the side wedges, W; the smaller ends of which might be suddenly tapered off, so as to be readily bent outwards a little, after being driven, and the latter, by the use of longer and stouter bottom wedges.

Mercurial Electric Light.—Professor Way, the well-known chemist, has recently made an important movement with his mercurial electric light, and he has shown it at Osborne and in Cowes Roads with excellent effect. The principle of the light is simply the application of electricity to a column or running stream of quicksilver—in this instance as fine as the point of a lady's needle. So long as the voltaic battery retains power to act with its wires upon this column, so long must the light burn—the strongest and purest light in the known world, and the nearest approach to sunlight that the skill of the chemist and man of science have yet produced, and this without actual combustion taking place or the quantity of the mercury being reduced, the supply of acids to the battery being its sole expense after its first cost, excepting wear and tear. At the trial, the professor with his apparatus left Portsmouth harbour in a steamer shortly before dark, and steered direct for Cowes. On the sponson of the steamer was placed the battery. Abaft the foremast hung one of the professor's simple apparatuses as a masthead light. On a moveable circular platform placed on the vessel's after-hatch, a similar apparatus to the one hung up aloft stood, to which was attached a lens, but both of them as yet unlit. The apparatus is of the simplest possible form, consisting merely of an oval shaped pair of tubes connected at each end, a round hollow globe about the size of an orange, in which is placed the mercury. The mercury runs from a point to a cup in the centre, enclosed within a glass tube, and here the subtle liquid is heated to a white heat as it flows in a fine stream from the upper ball into the cup, and thence into the lower one, thus producing an indestructible wick. The wires which connect the battery with the apparatus were made by Messrs. Silver, and are, perhaps, the most perfect of their kind yet constructed. These wires are coated with silver, enclosed in India rubber, and have an outside coating of braided hemp, the whole pliable as common packthread. To look at the light, with a view to a close inspection of the cup, with the naked eye, would be about as useless as to look at the sun at noonday. A pair of coloured glasses, however, show that this light, which can only be compared to the sun for its brilliancy and power, is only of the same circumference as the cup itself—the size of a threepenny silver piece, and of little more diameter. Midway between the aftermost light and the voltaic battery, is a brass standard, a few inches high, with which the wires are connected; and by pressing a button on the top of this, simple as the key of a piano, the light can be given in flashes of as long or as short a duration as the operator pleases. This is, however, more beautifully and correctly carried out by a small instrument of Mr. Way's. It consists of a piece of clockwork, having in front a revolving disc, the face of which is covered with numerous holes with pins to fit in as may be required. In front of the disc are two small cylinders with pistons and arms attached. As the disc revolves, the pins in its face lift the pistons in the cylinders, and cut off the connection between the battery and the lighting apparatus, producing flashes of light of any duration that may be required, with their accompanying intervals of darkness, and admirably adapted for a revolving light, or as a code of signals for night service. In fact, there would appear to be no limit to the uses to which this discovery may be applied, and so simple is it in its manipulation that the choicest music of the great masters may be henceforth accompanied by expressive flashes of electric light. When the steamer arrived off the Motherbank, the light aloft was lit by attaching to it the ends of the wires from the voltaic battery. So soon as the glass tube became sufficiently heated to throw off the mercury from its surface, the light exhibited its power and beauty—the steamer's usual masthead light, which was hoisted in its usual position, appearing but a dull red speck alongside it. Its effect upon the human countenance was, however, by no means favourable, casting on all on board the steamer a strange unearthly hue. Mauve colour, as it has become fashionable to term it on the ladies' dresses or bonnets, was brought out by the light with astonishing brilliancy. On reaching Cowes Roads, crowded with yachts, and all displaying lights, the contrast between the electric light and those shown by the yachts was something wonderful. The electric light was shining in its pale pure brilliancy aloft, while the hundreds of lights displayed by the yachts and by the town of Cowes, its Club House and hotels, dwindled down to dull red specks. The lens applied to the after light threw broad pathways of light to and fro as the lens might be directed, bathing the low black hulls of the craft that were in the line of light with a flood of sunshine, as also the delicate tracery of their spars and rigging. A boat which left the steamer here for one of the yachts was lighted on its way by the lens. On the steamer's return, Norris Castle was passed, and the light thrown on its picturesque front. Ivy-covered towers, walls, and parapets were illuminated as with a stroke from an enchanter's wand. Off Osborne House the steamer was stopped for some time, and the light must have shown itself with good effect on the still waters of the Solent, in front of the beautiful marine residence of Her Majesty. The experiments—which, as already stated, are only preliminary to more important ones—were considered to have been fully satisfactory. With a light on this principle under her bows, the *Great Eastern* herself might have lighted her path across the waters of the Atlantic.

Science in its Relation to Social Existence.—When Galvani observed the contortions of the muscle in a dead frog, or even when Volti gave an explanation of them, how little could it be foreseen that the discovery would lead not only to the decomposition of bodies which had resisted all attempts to ascertain their constituent parts, and bring us acquainted with substances wholly unlike any before known, as metals that floated in water and took fire on exposure to the air, but, after having thus changed the face of chemical science, should also impress a new character upon the moral, judicial, and political world. Yet this has undeniably been the result of a discovery made by Volti, of an influence passing under Galvani's name, by an error similar to that which gives the name of Vespucci instead of Colombus to the New World. The power of the magnetic telegraph extends to the comfort of families, the cure of diseases, the transactions of business, the administration of justice, the operations of government in all its branches, civil and military, domestic and foreign; establishing an almost instantaneous communication between the remotest regions. But physical science has given us the means of personal intercourse as well as correspondence with remote places. How little could Watt, when employed as a common mechanic to repair a model engine, foresee that from the happy inventions which arose out of his deep reflection upon the agencies submitted to his studies, there would follow such a change in our relations with the natural world, as now sets winds, and tides, and currents, at defiance, and excludes in a great degree, the consideration of space and time from our calculations, and a yet greater revolution in our social system. Little did he think that the work he was thus beginning would, before another generation passed away, not merely change the whole course of commercial dealings, the communication of all countries one with another, and of all men among themselves in each, but affect the whole policy of nations, their relations in peace, and their operations in war. Again, when he introduced into this country the happy invention of Berthollet for bleaching by chlorates, little did either of these great men (satisfied as they were with the important step,) foresee that by the mixture of the same poison with another, such a victory over pain would be gained as should not only afford relief in almost all cases, but change the whole course of surgical operations; and now let it be added, that the process has lately been applied to save those insects whose marvellous architecture affords the most striking of all the proofs of divine action, according to the Newtonian doctrine of instinct. I can vouch for the entire success of the experiment, having lately performed the operation. Mr. Layard, of Dundee, furnished the antidote, having himself made the experiment upon several beehives. The security of ships and buildings by Sir W. Snow Harris's lightning rods has saved many lives and much property. Still more beneficial, because the risks from shipwreck are far greater than those from lightning, has been Sir D. Brewster's happy application of the science of which he is so great a master, to the construction of the Dioptic Lighthouse. But let us observe how vast an improvement of social life, and how valuable an addition to our power of executing the law has been another optical discovery, by which we have made the sun our fellow-workman. It would have been deemed a romance had any one foretold, from observing the effect of light in discolouring certain substances, such a consummation as obtaining the most accurate portraits in a second—portraits the minute accuracy of which hours and days of the painter's labour could not approach; and the consequent power, not only of preserving the features of those most revered and beloved, but of preventing the escape of criminals, the commission of numberless frauds, and the defeat of the injured in seeking the recovery of their rights. Nor let us forget the less important benefit of improving both our manufactures and the public taste, by multiplying perfect copies of all the great pictures in the world, so that for a few pence may be obtained the exact duplicates of Raphael's cartoons and every other renowned masterpiece—an application of art which we owe to the liberal and discerning patronage of the Prince Consort. My illustrious friend and colleague of the Institute, Arago, was so impressed with the vast importance of photography in all its relations that the last years of his life were chiefly occupied with whatever belonged to this subject. But the progress of geology, the discoveries respecting the strata whereof our globe is composed, and the history of their formation, have led to a yet more unexpected and far more sublime result than any we have been surveying—a result which is the source of the most delightful contemplation. A period of time in the revolution of ages has been ascertained before our species existed, and a succession of races discovered, inhabitants of our earth and of the ocean, all specifically different from any that we now know to exist. The act of creation is thus demonstrated from phenomena, independent of tradition, to have been performed by an almighty and all-wise Creator; the formation of man after his own image, and at a later period than that at which He formed other and less perfect creatures. While the great discoveries of La Grange and La Place, deduced from those of Newton, exhibit the law by which the system of the Universe is maintained eternal in its present state, all deviations being necessarily confined within fixed limits, the wonderful researches of Cuvier, upon the structure of our planet, have shown the origin of its inhabitants, proved that at a remote period, though not far removed from the era of history, our species did not exist, and thus given conclusive evidence of the awful Being's power "whose temple is all space, whose altar earth, sea, skies," and of His relation to ourselves; proving as clearly that we are His creatures as if one had risen from the dead.—*Lord Brougham.*

The Victoria Tubular Bridge at Montreal.—The length of the great Victoria Tubular Bridge erected across the St. Lawrence to connect the 500 miles of railway of the Grand Trunk Company, formed on each side of the river, is 9,000 feet, and its height in centre 60 feet above summer water level. It contains 3,000,000 cubic feet of masonry, and 8,000 tons of iron in its tubes through which the trains pass, the time occupied in going through the bridge being ordinarily about four minutes, but such is the capacity of the structure that trains could with equal safety be driven at the rate of sixty miles an hour. By means of this bridge, which will for ever stand the grandest monument to the engineering genius of Stephenson and Ross, Montreal, the commercial metropolis of Canada, becomes the centre of a railway diverging westwards to Lake Huron, and eastwards to Portland on the Atlantic Sea coast, and to Riviere du Loup, 250 miles below the tidal waters of the St. Lawrence—the whole length of line, without a break of gauge, being 1,000 miles. At Detroit, in the west, a direct connection has been made with the American railway system; so that a passenger from Europe, disembarking at Quebec or Portland, is conveyed to Chicago—a distance of upwards of 1,000 miles—with only one change of carriage. At Portland the Grand Trunk Railway connects, in its own depot, the cars of the Boston railways; so that direct communication with the whole of the New England, New York, and the Southern States is thereby obtained. At Riviere du Loup the proposed extensions of the Halifax and St. John's Railways will meet and thus will the capitals of Canada, Nova Scotia, and New Brunswick be brought within a twenty hours' run of each other. This accomplished, and nearly a third of the distance between the Atlantic and the Pacific in the direct line of the proposed railway route through British America will be completed, as a first instalment of an undertaking which, it is to be hoped, before a decade of years shall have passed away, will have become a fixed fact, and passengers between England and her Indian empire, will be traversing the American continent, and only occupying in the journey between London and Hong Kong about seventeen days. The country through which the line passes is salubrious and fertile to the base of the Rocky Mountains, and as British North America contains upwards of 4,000,000 square miles, or about an eighth of the habitable globe, with inexhaustible forests of the finest timber, mines of coal, iron, &c., a climate unsurpassed by any other country in the world, a field for the emigrant is offered, by the opening up of these vast regions, with advantages far superior to these of which the United States and the colonies in the Pacific can boast.

Originality.—It will not be denied by anybody that originality is a valuable element in human affairs. There is always need of persons, not only to discover new truths, and point out when what were once truths are true no longer, but also to commence new practices and set the example of more enlightened conduct and better taste and sense in human life. It is true, that there are but few persons, in comparison with the whole of mankind, whose experiments, if adopted by others, would be likely to be any improvement on established practice. But these few are the salt of the earth; without them human life would become a stagnant pool.—*J. S. Mill.*

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded May 2.

1103. William E. Gedge, Wellington Street, Strand—Improvements in the manufacture of bolts.—(Communication from Alexandre Joseph, and Jean R. Maré, of Bogny-sur-Meuse, Ardennes, France.)

Recorded June 11.

1428. Vital de Tivoli, Stanley Place, Pimlico—Improvements in civil and military ambulances.

Recorded July 3.

1602. John Johnson, Ashton-under-Lyne, Lancashire—Certain improvements in Jacquard machines.

1610. Thomas L. Braynard, New York, U. S.—Improvements in apparatus for working, training, and levelling cannon on board of vessels, and in fortifications, redoubts, and other places.—(Communication from John J. Walsh, New York, U. S.)

Recorded July 14.

1701. Samuel C. Lister, Manningham, Yorkshire—Improvements in machines for preparing silk, flax, and other fibrous materials.

Recorded July 18.

1742. Richard A. Brooman, Fleet Street—The treatment of gluten, in order to manufacture a substance to be employed in printing fabrics and other industrial uses, in substitution for albumen.—(Communication from Lies Bodard, Strasbourg, France.)

Recorded July 21.

1770. William Turner and John W. Gibson, Hammersmith Works, Dublin—Improvements in bridges.

Recorded July 23.

1778. Richard A. Brooman, Fleet Street—A method of, and machinery for, goffering or impressing colouring and gilding, or otherwise covering with metal, leather, and fabrics, and substances in a sheet state.—(Communication from Jacques M. Dulud, Paris.)

Recorded July 24.

1786. Edward Harrison, William Bradbury, and James Buckley, Oldham, Lancashire—A certain improved compound or compounds to be used as a substitute for gunpowder.

Recorded July 25.

1798. Jeffries Kingsley, Great Coram Street—Improvements in railways and in carriages to be used thereon.

Recorded July 27.

1830. Henry Jackson, Oak Works, Oak Lane, Limehouse—Improvements in fire bars.

Recorded July 28.

1834. Gaston C. A. Marquis d'Auxy, Rue Lafayette, Paris, France.—An improved apparatus for the preservation of corn.

Recorded July 30.

1844. Francis W. Searle, Coleman Street—An improved apparatus for giving information at doors and places of business.

1846. William Gough, Birmingham, Warwickshire—An improvement or improvements in balancing millstones.

1848. Hilton Greaves, Oldham, Lancashire—Improvements in hecks, or mechanism, or arrangements, used in warping yarns or threads.

1850. William Spence, Chancery Lane—Improvements in the manufacture of hats.—(Communication from Pierre Dujaric, Paris.)

Recorded July 31.

1852. Alphonse V. Donnet, Lyons, France—An improved registering water meter.

1853. John M. Douglas, Cupar, Fifeshire—Improvements in the delivery of the cut crop from reaping and mowing machines.

1855. Henry W. Ford, Gloucester—Improvements in elastic buffing and drawing apparatus suitable for railway vehicles.

1856. John Goucher, Worksop, Nottingham—An improvement in beaters for thrashing machines.

1857. John S. Jarvis, Wood Street—An improved scarf or neck tie.

1858. William Pickstone, York Street, Manchester—Improvements in the manufacture of tubes or pipes.

1859. Frederick H. Trevithick, Guildford Road, Clapham, Surrey, and Richard Jones, Botolph Lane—Improvements in means or apparatus to be used in effecting the preservation of animal and vegetable substances.

1860. Joseph Willcock, Chancery Lane—Improvements in photographic apparatus.—(Communication from Pierre M. T. O. C. Albtics, Rue Vivienne, Paris.)

Recorded August 1.

1861. Joshua Jackson, Queen Street, Wolverhampton, Staffordshire—Purifying and cooling water and atmospheric air, which he calls "The carbonic aerial water and air purifier and cooler."

1862. Edward O. W. Whitehouse, Brighton, Sussex—Improvements in testing insulated conductors.

Recorded August 2.

1865. Abraham Ripley, Bridge Street, Blackfriars—Improvements in the mode and process of treating the waste and refuse of leather, and in the mode of treating and operating upon these in order to form a new article or fabric.

1866. Albert F. Haas, Jewin Street—Improvements in dolls.—(Communication from Fischer Naumann and Company, Ilmenau, Saxe-Weimar.

1867. Ebenezer Patridge, Stourbridge, Worcester—Improvements in axles and axle boxes.

1868. John Grant, Hyde Park Street—Improvements in breech-loading guns.

1869. William Ford, and Thomas Proctor, Derby—Improvements in sewing machines.

1870. Auguste V. Morel, Paris—An improved apparatus for printing in colours, textile fabrics and other surfaces.

1871. William E. Newton, Chancery Lane—Improvements in knitting machinery.—(Communication from James G. Wilson, New York, U. S.)

1872. John C. Haddan, Bessborough Gardens, Pimlico—Improvements in the manufacture of rifled cannon, and of projectiles to be discharged from rifled cannon.

Recorded August 3.

1873. John T. Pitman, Gracechurch Street—An improved process in the vulcanization of India rubber, and other similar substances under pressure.—(Communication from Messrs. Bourn, Brown, and Chaffe, Providence, Rhode Island, U. S.)

1874. Benjamin Arnold, East Greenwich, Rhode Island, U. S.—Improvements in machinery for netting.

1875. John T. Pitman, Gracechurch Street—An improved press.—(Communication from Messrs. Bourn, Brown, and Chaffer, Providence, Rhode Island, U. S.)

1876. John Hall, Blackburn, Lancashire—Improvements in sewing machines.

1877. Edward Billington, Manchester, Lancashire—Improvements in machinery or apparatus for combing cotton, wool, flax, tow, silk, and other fibrous materials, and in machinery or apparatus for preparing the same to be combed or carded.

1878. Francis X. Kukla, Pentonville Road—An improved self-regulating gas burner.

1879. James Higgin, Manchester, Lancashire—Improvements in railways, in railway carriages, and in the mode of retarding and stopping railway carriages.

1880. Samuel S. Skipton, 78th Highland Regiment of Foot—An improved splint for gunshot and other compound fractures of the limbs.

1881. Edouard Armand, Paris—Improvements in horses' bridles.

1882. William E. Newton, Chancery Lane—A new or improved musical instrument.—(Communication from Clarendon Williams and E. F. Falconet, Nashville, Davidson, Tennessee, U. S.)

1883. William E. Newton, Chancery Lane—An improvement in wooden-soled boots and shoes or clogs.—(Communication from Marshall Jewell, Hartford, Connecticut, U. S.)

1884. William E. Newton, Chancery Lane—Improvements in washing machines.—(Communication from Henry M. Coombs and Levi W. Nelson, Portland, Multnomah Oregon, U. S.)

1885. William Clark, Chancery Lane—Improvements in embroidering machines.—(Communication from Mr. Alphonse Maureau, Paris.)

1886. John Stephens, Augusta Place, Lyncombe Hill, Bath—Improvements in the arrangement of wheeled carriages, to facilitate their movement on soft or uneven land.

1887. Jacques Rives, Rue des Enfants Rouges, Paris—Improvements in looms for weaving, and in preparing cards for the same.

1888. Ephraim U. Thompson, Bristol, Maine, U. S.—Improvements in machinery or apparatus to be applied to a shroud, stay, or other portion of the rigging of a navigable vessel in order to enable the setting or tightening thereof to be effected and maintained.

Recorded August 4.

1890. William Taylor, Jeremiah Pendlebury, Thomas Bailey, and Richard Harrell, Preston, Lancashire—Improvements in "temples," used in weaving textile fabrics.

1891. William E. Gedge, Wellington Street, Strand—An improved cork-cutting machine.—Communication from Barthelemy Belzon, St. Paul de Fenouillet, France.)

1892. James Hunter, Coltness Iron Works, Cambusnethan, Lanarkshire—Improvements in machinery or apparatus for boring and winding for mining purposes.

1893. Johan F. Klintin, Stockholm—Improvements in ships' logs.

1894. James Lancelott, Rose Terrace, Buxton Road, Essex—Improvements in machinery or apparatus for the manufacture of small metallic chains, and also in the manufacture of such chains.

1895. James Higgins and Thomas S. Whitworth, Salford, Lancashire—Improvements in carding engines.

1896. Thomas Webb, Smallwood Manor, Uttoxeter Staffordshire—Improvements in gates.

Recorded August 6.

1897. William Redgrave, Wood Street, Lambeth, Surrey—An improved inflated undulating artificial bust.

1898. Adolph J. Seitz, Newcastle-upon-Tyne, Northumberland—An improved manufacture of artificial sulphate of baryta.—(Communication from Adolph Seitz, Gustrow, Mecklenberg Schwerin.)

1899. Henry De Mornay, Bayswater—Improvements in apparatus for sorting and preparing tea for the market.

1900. George Jeffries, Norwich—Improvements in machinery or apparatus for filling cartridges.

1901. Frederick Schwann, Gresham Street—Improvements in dressing and stiffening fabrics and yarns.

Recorded August 7.

1902. Robert Coxon, Beeston, near Leeds, Yorkshire—Improvements in hoops or apparatus for giving shape or distension to female attire.

1903. Frederick Hudson, Blackfriars Road, Surrey—Improvements in spring rollers for window blinds.

1904. Joseph Bonne, Clus Indre, France—Improvements in furnaces intended to work iron ore.

1905. Charles L. Davies, Queen's Square, Bloomsbury—Improved apparatus for printing and embossing.

1906. William Clark, Chancery Lane—Improvements in pattens for clogs, and coverings for the feet.—Communication from Madame M. C. Gobert nee Lebrun, Paris.)

1907. William E. Newton, Chancery Lane—Improved apparatus for retarding carriages.—(Communication from Jules Piault, Paris.)

1908. Richard A. Brooman, Fleet Street—Improvements in mills for grinding corn and other grain.—(Communication from Pierre E. Brisson, Orleans, France.)

Recorded August 8.

1909. David Moseley, Chapel Field Works, Ardwick, Manchester, Lancashire—Improvements in the manufacture of hats, caps, bonnets, and other coverings for the head, and in machinery connected therewith.

1910. Charles Stevens, Welbeck Street, Cavendish Square—An improved plant protector.—(Communication from Jules Romiguiere, Rue Laffite, Paris.)
1911. Charles Stevens, Welbeck Street, Cavendish Square—An improved mode of binding up brooms, together with the machine used for that purpose.—(Communication from Perrin de Caderousse, Rue Laffite, Paris.)
1912. Edwin M. Thornton, Brooke Street, Holborn—An improved rein holder.
1913. James Webster, Birmingham, Warwickshire—Improvements in the manufacture of prussiate of potash and prussian blue.
1914. Richard A. Brooman, Fleet Street—An improved excavating machine for boring tunnels and performing other excavating operations.—(Communication from Messrs. Hyppolyte A. Buquet and Raoul J. M. Destrem, Paris, and Jean B. Valauri, Turin.)
1915. Richard A. Brooman, Fleet Street—Improvements in apparatus for burning gas in carriages, ships, and other moving structures.—(Communication from Pierre Huzon, Paris.)
1916. Jean B. Cretal, St. Malo, France—A new smoking pipe.
1917. Francis Davidson, Liverpool, Lancashire—Certain improvements in marine steam engines.
1918. John S. Gisborne, Birkenhead, Cheshire—Improvements in apparatus for supporting or carrying electrical conductors for telegraphic communication.
1919. James Fielding, David Whittaker, and Benjamin Croasdale, Blackburn, Lancashire—Improvements in looms for weaving.
1920. George Hall, jun., Montrose, Forfarshire—Improvements in the form and construction of reaping machines.
1921. John Barlow, Lauder Street, Saltley, Birmingham, Warwickshire—Improvements in railway signals, for communicating with the engine driver, guards, and other parties while the train is in motion.
1922. Charles F. Flounders, Liverpool, Lancashire—An improvement or improvements in duplicating photographic impressions, and also for certain machinery for the same.
1923. Matthew Dodds, Bedburn Iron Works, Hamsterley, Durham—Improvements in machinery for moulding, forming, or shaping articles of iron and other malleable metals, and for shearing or cutting iron and other metals.
1924. Ellison Smith, Keighley, Yorkshire—Improvements in machinery for preparing wool, cotton, flax, and other fibrous materials for spinning.
1925. Alfred V. Newton, Chancery Lane—Improvements in the mode of and apparatus for superheating steam.—(Communication from Solomon N. Caravalho, Baltimore, U. S.)
1926. George H. Newton and Abraham Wild, Oldham, Lancashire—Improvements in mules for spinning and doubling.

Recorded August 9.

1927. Filippo Grimaldi, Great Prescot Street—Improvements in the instantaneous generation of steam.
1928. Henry Earle and William Earle, Hereford—An improvement in connecting skins or sheets of parchment, vellum or paper together, and in attaching seals to deeds and other instruments.
1929. Henry Cockey and Francis C. Cockey, Frome Iron Foundry, Somersetshire—Improvements in driving chaff and root cutters, and other agricultural machines.
1930. Anton Neumann, Pancras Lane—Improvements in the treatment of food for cattle, and in the machinery or apparatus employed therein.—(Communication from Franz X. Kientzle and Joseph Reiss, Colmar, France.)
1931. Anton Neumann, Pancras Lane—Improvements in the hanging and fastening of doors, lids, and other hinged covers.—(Communication from Franz X. Kientzle Colmar, France.)
1932. Pierre Manvillin, Paris—An improved sewing and embroidering machine.
1933. Alfred Eddington, Springfield, Chelmsford, Essex—Improvements in draining ploughs.
1934. Francis Parker, Wood Street, Northampton—Improved coverings for the feet or parts thereof, suitable more especially as foot warmers for railway and other travellers.
1935. Alfred V. Newton, Chancery Lane—An improvement in ventilating buildings, vessels, and mines.—(Communication from Sidney M. Stone, New Haven, Connecticut, U. S.)

Recorded August 10.

1936. Joseph Underwood, Birmingham, Warwickshire—An improvement or improvements in dressing cases and writing cases.
1937. Charles Stevens, Welbeck Street, Cavendish Square—Improvements in boilers.—(Communication from Jean Carrere, Rue Laffite, Paris.)
1938. John Crawford, Manchester, Lancashire—A certain improvement in machinery or apparatus for spinning cotton and other fibrous substances.
1939. John Summerscales, Coney Lane Mills, Keighley, Yorkshire—Improvements applicable to churns, washing and mangling machines, dough-kneading machines, and mixing machines.
1940. Frederick A. Enklaar, Hattem, Holland—Improvements in implements for cultivating the soil.
1941. Thomas W. Plum, Blaenavon Iron Works, Monmouthshire—Improvements in fixing tyres upon wheels and chairs upon sleepers, part of which is applicable to rivetting generally.
1942. Samuel Middleton, Whitefriars Street—Improvements in combining and preparing surfaces of paper and other materials for the purpose of preventing forgery or fraud in the manufacture of bank notes, cheques, bills of exchange, or other valuable documents.
1943. John Giles, Cannon Street—Improvements in steam engines and in steam generators.

Recorded August 11.

1944. Charles de Bergue, Dowgate Hill—Improvement in the permanent way of railways.
1945. Richard Smith, West Street, Glasgow, Lanarkshire—Improvements in the manufacture of colouring matters for dyeing and printing fabrics.
1946. John Wilkins, Essex Street, St. Peter's, Islington—An improved inkstand.
1947. Richard Phillips, Wavertree, near Liverpool, Lancashire—Improvements in harvesting machines.—(Communication from Mr. Jesse Whitehead, Manchester, Chesterfield, Virginia, U. S.)
1948. Henry Holland, Birmingham, Warwickshire—An improvement or improvements in the manufacture of umbrellas and parasols.
1949. Henry Cotterell, Balsall Heath, King's Norton, Worcestershire—Improvements in the manufacture of umbrellas and parasols.
1950. Thomas Hart, Northampton—An improved brick-making machine.

Recorded August 13.

1951. Constant P. E. Poussier, Paris—Improvements in the manufacture of alkaline or other bichromates.
1952. Emma B. Orange, Barentin, Seine Inferieure, France—An improved method of, and apparatus for, unloosening horses instantly from a carriage when frightened or running away.
1953. James Stodart, Walworth, Surrey, and John T. Bennett, Dalston—Improvements in ships' propellers.
1954. Stephen Norris, Great Peter Street, Westminster, and Robert Rogers, King Street, Convent Garden—Improvements in the manufacture of boots, particularly adapted to military purposes.
1955. Henry Hewetson, Blackheath, Kent—Improvements in rockets and in apparatus for discharging the same.
1956. James Stuart, Vulcan Place, Castor Street, Poplar—Improvements in treating hydro-carbon oils.
1957. Alfred V. Newton, Chancery Lane—An improved mode of treating waste vulcanized India rubber.—(Communication from John H. Cheever, New York, U. S.)
1958. Thomas Greenwood, Leeds, Yorkshire—Improvements in the construction of projectiles.
1959. Alfred V. Newton, Chancery Lane—Improvements in the mode of, and machinery for, manufacturing hose pipe.—(Communication from John H. Cheever, New York, U. S.)
1960. Alfred V. Newton, Chancery Lane—Improvements in the mode of and apparatus for manufacturing packing for pistons and other parts of machinery.—(Communication from John H. Cheever, New York, U. S.)
1961. Alfred V. Newton, Chancery Lane—Improvements in the manufacture of driving bands, and in the machinery to be employed in such manufacture.—(Communication from John H. Cheever, New York, U. S.)

Recorded August 14.

1962. George Leslie, Mall—Improvements in preserving casks and apparatus connected therewith.
1963. John Billing, Abingdon Street, Westminster—Improvements in chimney tops.
1964. James Reid, Limehouse—Improvements in piano-fortes.
1965. Nicholas Wehnert, King Street, Cheapside—Improvements in the consumption of fuel, in superheating steam, and in the apparatus employed therefor.—(Communication from Paul Trochon, Rue Buffaut, Paris.)
1966. James Lark, Strood, Kent—Improvements in grinding cement and other substances and in the machinery or apparatus connected therewith.
1967. William Field and Edward Jeffreys, Shrewsbury, Salopshire—Improvements in the permanent way of railways.
1968. Edward Wroughton and Thomas Holmes, Nottingham—Improvements in machinery for ornamenting or embossing lace or other fabrics.
1969. Robert D. M'Kibbin, Earl Street, Blackfriars—An improved waterproof and non-inflammable material applicable to roofing and to other purposes, for which felt, tarpauling, oil cloth, and such like materials are now used.

Recorded August 15.

1970. Pierre Faure, Avignon, Vaucluse, France—A centrifugal hydraulic pump.
1971. Hippolyte Courtot, Reims, Marne, France—An improved machine, with a drawer and moveable knife, used to part and break sugar.
1972. William Jenkinson, Bentley, near Doncaster, Yorkshire, and Alfred Solbé, Leadenhall Street—Improvements in the connections or joints of the posts and frames of bedsteads and iron houses.
1973. Henry B. Barlow, Manchester, Lancashire—Improvements in the manufacture or preparation of indigo.—(Communication from Messrs. Breslauer, Meyer & Co., Berlin, Prussia.)
1974. Affifi Lely, Redditch, Worcester—New or improved machinery for grooving sewing-machine needles.
1975. Gabriel Doidi, High Street, Borough, Southwark, Surrey—Improvements in the preservation of meats.
1976. William Holms, and Jabez Oldfield, Glasgow, Lanarkshire—Improvements in machinery or apparatus for weaving.
1977. George Gage, Luton, Bedford—Improvements in the colouring and manufacture of straw plaits.
1978. Peter A. Godefroy, King's Mead Cottages, New North Road—Improvements in the mode of insulating and laying down inland telegraphic wire.
1979. William Walton, Houghton Dale, Denton, near Manchester, Lancashire—Improvements in the manufacture of wire cards and in machinery used therein.
1980. Charles Green, and William Asbury, Birmingham, Warwickshire—Improvements in machinery for manufacturing tubes for tubular steam boilers.
1981. Alfred Fryer, Manchester, Lancashire—Improvements in centrifugal machines.
1982. James Samuel, Great George Street, Westminster, and George F. Train, Liverpool, Lancashire—Improvements in rails for streets and roads, and in wheels and axles to be used thereon.
1983. Jean Bluzat, Marcelin Riviere, Claude Bluzat, and Frederic Maigron, Marseille, France—Improved machinery or apparatus for obtaining and applying motive power.

Recorded August 16.

1984. Joseph Bentley, Liverpool, Lancashire, and David Bentley, Birmingham, Warwickshire—Improvements in breech-loading fire-arms.
1985. William Petrie, Woolwich, Kent—Improvements in the manufacture of sulphuric acid, and in apparatus employed therein, parts of which improvements are applicable to the obtaining of draught, to the condensing of gases, and to the constructing of flues.
1986. Herrmann Grundy, St. Louis, U. S., America—Improvements in pontoons.
1987. Thomas Mellodew, Oldham, and Charles W. Kesselmeyer, Manchester, Lancashire—Improvements in the manufacture of velvets and velveteens.
1988. Joseph J. Coleman, Holly Royd, Halifax, Yorkshire—Improvements in the manufacture of colouring matters for dyeing and printing.

Recorded August 17.

1989. Charles F. Atkinson, Sheffield, Yorkshire—The application of steel or iron to the manufacture of collars and wristbands to be worn as articles of clothing.
1990. Richard Smith, West Street, Glasgow, Lanarkshire—Improvements in the preparation and production of colouring matter.
1991. Robert Mole, and Frederick M. Mole, Birmingham, Warwickshire—An improvement or improvements in the manufacture of matchets and cutlasses.
1992. James Wardle, Bury, Lancashire—Certain Improved arrangements of the flues of steam boilers.
1993. William Middleton, and Daniel Fox, Glossop, Derby—Improvements in machinery or apparatus for making paper.

1995. George Nimmo, Glasgow, Lanarkshire—Improvements in the manufacture of steel.
1996. Robert Read, Leicester—Improvements in the manufacture of waterproof fabrics permeable to air.
1997. Alphonse Pirrote, Liege, Belgium—Improvementa in the coustruction of condensers.
1998. John Garnett, Windermere, Westmoreland—Improvements in writing-desks, and in apparatus connected therewith.

Recorded August 18.

1999. Robert Tempest, and James Tomlinson, Roach Iron Works, Rochdale—Improvements in certain machines for preparing cotton and other fibrous materials.
2000. Daniel Foxwell, Manchester, Lancashire—Improvements in sewing machines.
2001. William H. Crispin, Marsh Gate Lane, Stratford, Essex—An improved propeller.
2002. George Tidcombe, Watford Iron Works, Hertford—Improvements in hydrostatic presses.
2003. Robert Romaine, Devizes, Wilts—Improved machinery applicable to steam cultivation.
2004. Frederick B. Houghton, Eldon Road, Kensington—Improvements in the manufacture of paper when the straw of wheat, barley, oats, rye, or rice is employed.
2005. Thomas Grahame, Leamington, Warwickshire—Improvements in projectiles and cannons, or barrels for discharging the same.

Recorded August 20.

2006. James Boott, Lille Town, France—Improvements in the manufacture of various weavings in bobbin-net, and in machinery for the same.
2007. Alfred V. Newton, Chancery Lane—An improved guard for boots, shoes, and clogs. —(Commnnication from William A. Harris, Providence, Rhode Island, U. S.)
2008. Alfred V. Newton, Chancery Lane—An improved mode of coupling the rails of railways.—(Communication from Joseph M. Heard, Prairie Station, Monroe, Mississippi, U. S.)
2009. Edward Bridgman, Tarragona, Spain—Improvements in the construction of wet gas meters.

Recorded August 21.

2010. Hugh Greaves, Besborough Gardens, Pimlico—Improvements in the construction of railways, tramways, or tracks for carriages, and in the appliances for the conveyance of passengers, parcels, and letters thereby.
2011. John Neal, Birmingham, Warwickshire—A new or improved mixture or composition for fumigating plants, and thereby destroying insects infesting the said plants.
2012. William E. Gedge, Wellington Street, Strand—Improvements in apparatus for obtaining motive power based upon the hydrostatic paradox.—(Communication from Louis Leygonie, Limoges, France.
2013. James Campbell, Adelaide Road, Haverstock Hill—Improvements in apparatus for removing sand or mud from the bottom of the sea, and of rivers, docks, and harbours.
2014. Charles E. Wilson, and Henry G. Hacker, Monkwell Street—Improvements in machinery for the manufacture of chenile.
2015. Edward Hall, Dartford, Kent—Improvements in machinery for grinding and smoothing glass.
2016. Moritz Jacoby, Nottingham—Improvements in the manufacture of twist lace in twist lace or bobbin net machinery.
2017. Angier M. Perkins, Francis Street, Regent Square, Gray's Inn Road—Improvements in apparatus for distilling sea and other water.

Recorded August 22.

2018. Robert West, Walsall, Stafford—Improvements in the construction of wet gas meters.
2019. Henry M. Clarke, Boston, Massachusetts, U. S.—An improved machine for grinding or reducing paper stuff to pulp, and sizing the same.—(Communication from Joseph Jordan, Hartford, Connecticut.)
2020. Joseph Jobin, and Auguste Boll, Robert Street, Chelsea — Improvements in cigarettes and mouthpieces, and in apparatua used in manufacturing cigarettes.
2021. Edward A. Dana, Massachusetts, U. S.—Relating to ordnance as well as fire-arms.—(Communication from John P. Schenkl, Boston, Massachusetts.)
2023. William Clark, Chancery Lane—Improvements in the preparation or manufacture of manure.—(Communication from Louis J. F. Margueritte, and Alfred L. de Sourdeval, Paris.)

Recorded August 23.

2025. James Newhouse, Farnworth, Bolton-le-Moors, Lancashire—Improvements in or applicable to certain machines for spinning and doubling cotton and other fibrous materials.
2027. Edward O. W. Whitehouse, Brighton, Sussex—Improvements in testing insulated conductors.
2029. William W. Cannon, and Robert Jackson, Bolton, Lancashire—Certain improvements in machinery or apparatus for spinning cotton and other fibrous substances.
2030. Sir John S. Lillie, Pall Mall—Improvements in blocks for building purposes.
2031. Charles Weiss, Huddersfield—Improvements in the manufacture of cloth, and in preparing and cleaning woollen flock.—(Communication from Frederick S. Brittan, Murray Street, New York, U. S.)
3032. William Spence, Chancery Lane—Improvements in padlocks and keys for the same. —(Communication from Solomon Andrews, Perth Amboy, Middlesex, New Jersey, and Thomas Morrell, New York.)
2033. Jean H. C. Lacroisade, Bard, St. Martin, Paris—An improved apparatus for heating tailor's irons and other irons, also for cooking and other heating purposes, with irons adapted to be used therewith.

Recorded August 24

2034. Richard R. Bealey, Manchester, Lancashire—Improvements in shirt-fronts.
2036. William Keen, Horton, near Slough, Buckingham—Improvements in castors.
2037. Henry Pritty, Victoria Grove West, Brompton—Improvements in apparatus used to damp paper for copying letters and other documents.
2038. Antoine Halter, and Francois D. W. Dourard, Rue de Malte, Paris—Improvements in the manufacture of flexible tubes for the conveyance of water, illuminating gas, or other fluids.
2039. Stephen Greenwood, Butterfield Place, Cropper Lane, Bradford, Yorkshire—Certain improvements in looms for figure weaving.
2040. Frederick Lambe, Cushion Court, Old Broad Street—Improvements in the construction of certain parts of oil lamps and other lamps.—(Communication from Henry Coulter, Philadelphia, U. S.)
2041. Andrew Barclay, Kilmarnock, Ayrshire—Improvements in pumping engines.
2044. William Clark, Chancery Lane—Improvements in apparatus used in reproducing designs in tapestry or wool work—(Communication from Mr Charles L. Roguier, Paris.)
2045. Julian J. Revy, York Street, Portman Square—An improved construction of screw propeller.
2046. George Kershaw, Upton Cottage, Slough, Bucks—Improvements in the construction of medi o-electric surfaces.

Recorded August, 25.

2047. William Thomson, Glasgow, Lanarkshire, and Fleming Jenkin, Stowting, Kent—Improvements in the means of telegraphic communication.
2048. George Davies, Serle Street, Lincoln's Inn—Certain improvements in the construction of bomb shells.—(Communication from William Rice, Philadelphia, U. S.)
2049. Ferdinand G. M. de Baran, Paris—An improved method of stopping bottles, or other vessels for containing gaseous liquids.
2050. Jonathan Newall, Dunkinfield, Cheshire—Certain improvements in apparatus for "Transferring the latent heat of steam to water or other fluids.
2051. John Wilkes, Thomas Wilkes, and Gilbert Wilkes, Birmingham, Warwickshire—A new or improved method of manufacturing wire for electric telegraphs, and for such other uses as the same is or may be applicable to.
2052. Edwin T. Truman, Old Burlington Street—An improved method of cleansing and purifying gutta percha, and other like substances, and their compounds, and an improved apparatus to be employed therein.
2053. Alfred V. Newton, Chancery Lane—An improved mode of treating hides and skins preparatory to the tanning process—(Communication from A. D. Lufkin, Cleveland, Ohio, U. S.)
2055. Robert Jobson, Dudley, Worcester, and Robert J. Ransome, Ipswich—Improvements in apparatus used in producing moulds for casting.
2056. John Chatterton, Highbury Terrace, and Willoughby Smith, Pownall Road, Dalston —Improvements in the manufacture of telegraphic cables

Recorded August 27.

2058. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Improvements in salt cellars, pepper-castors, and similar utensils.—(Communication from Mr. J. B. L. Laine Paris.)
2059. William Clark, Chancery Lane—Improvements in fire-arms.—(Communication from Charles C. E. Minie, Boulevard St. Martin, Paris.)
2060. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in the manufacture of sheet tin, and in the machinery or apparatus employed therein.—(Communication from Francois P. E. Massiere, Paris.)
2061. John Arrowsmith, Bilston, Staffordshire—New or improved sash-iron for conservatories and other structures, made principally of glass, and also for windows and skylights, and other like purposes.
2062. George T. Bousfield, Loughborough Park, Brixton, Surrey—Improvements in thrust bearings for propeller shafts, and for other purposes.—(Communication from E. S. Renwick, Broadway, New York, U. S.)
2063. George T Bousfield, Loughborough Park, Brixton, Surrey—Improvements in building water craft.—(Communication from E. S. Renwick, Broadway, New York, U. S.)
2064. George T. Bousfield, Loughborough Park, Brixton, Surrey—Improvements in stuffing boxes, and the packing thereof.—(Communication from E. S. Renwick, Broadway, New York, U. S.)
2065. George T. Bousfield, Loughborough Park, Brixton, Surrey—Improvements in surface blow-offs for steam-boilers.—(Communication from E. S. Renwick, Broadway, New York, U. S.)
2066. Richard A. Brooman, Fleet Street—Improvements in melodeons and similar keyed musical instruments.—(Communication from Joseph P. Pirsson, New York, U. S.)
2067. Claude L. Piaton, Lyon Town, France—Machinery or apparatus for washing yarns and other textile fabrics or materials in skeins.
2069. Alfred V. Newton, Chancery Lane—Improvements in bakers' ovens.—Communication from Iverson W. Knapp, New York, U. S.)
2070. Colin Mather, Salford, Lancashire—Improvements in gas singeing apparatus.

Recorded August 28.

2071. Peter Effertz, Manchester, Lancashire—Improvements in machinery or apparatus for making bricks, tiles, and similar articles, and in apparatus for transporting the same, which improvements are also applicable for the utilizing of turf peat, coal dust, or similar substances.
2072. Jacob H. Radcliffe, Oldham, Lancashire—Improvements in lubricating cans or vessels.
2073. Henry Marriott, Preston, Lancashire—Improvements in fire-escapes.
2074. Charles W. Siemens, Great George Street, Westminster—Improvements in engines to be worked by the alternate expansion and contraction of steam and other elastic fluids,
2076. Edward Ellis, St. Ann's, Well Road, Nottinghamshire, and Wiliam Redgate, Nottingham—Improvements in apparatus employed in bobbin net, or twist lace machines.
2077. Benjamin Hirst, Leeds, Yorkshire—Improvements in the construction of steam and other engines.

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 18th August, to 10th September, 1860.

August	18th,	4,283	Thomas Brightly, Saxmundham, Suffolk—"Improved perforating macbine."
	18th,	4,284	John Pears, Birmingham—"Railway roof, ship, and other shadowless lamps."
	24th,	4,285	Henry Wilkinson, Alston Moor, Cumberland—"Chnrn."
	25th,	4,286	Telford and Co., 15 Wrottesley Street, Birmingham—"Bedstead fastener."
	31st,	4,287	Browne and Payne, Sackville Street, Dublin—"Knickerbocker pants."
Sept.	6th,	4,288	Macleod and Co., 75 Buchanan Street, Glasgow—"Military or volunteer cloak."
	10th,	4,289	Charles Seward, King's Clere, Southampton—"Smith's forge."
	10th,	4,290	Kennan and Sons, 19 Fishamble Street, Dublin—"Tangential strainer for iron fences."

THE DOUBLE REFRACTION AND POLARIZATION OF LIGHT.

If we lay a sheet of glass of any thickness upon a piece of paper on which we have marked a black spot, that spot in whatever direction we look will never appear otherwise than single. This will also be the case if we survey the spot through a vessel of water. But if we take a crystal of Iceland spar (which, chemically speaking, is a carbonate of lime), and place it over the spot, two spots will be seen, and, curious to relate, if we turn the crystal round, as it lies upon the paper, one of the spots will appear to move round the other. This property of doubling the image has been found to be possessed by all crystalized minerals, except those whose fundamental form is the cube. All animal and vegetable bodies are also found to possess it, although in these it is frequently present in so minute a degree that it can only be detected by careful experiment.

First, let us see in what the phenomenon of simple refraction consists. When a ray of light impinges upon a body having a density different from the medium through which it has been passing, it is either reflected, that is, bent back, into the original medium (in which case the angles of the incident and reflected rays with the surface are equal); or, it enters and passes through the body. In this case, its course becomes altered, and the direction it pursues is not a straight prolongation of the line it had previously followed. It is *refracted*, or bent out of its course, and the amount of deviation is constant for each body, or, as mathematicians express it, the cosines of the inclinations of the two portions of the ray to the bounding surface are in an invariable ratio. It is this property that causes a stick to appear bent when partly plunged into water; it likewise causes any object lying at the bottom of a piece of water to appear in a different place from that which it really occupies. A fact that may be easily verified in this way—place a black bead or any other small object at the bottom of a vessel, and move away from it until the bead is just seen over the edge. Now let water be cautiously poured into the vessel by a second person so as not to disturb the position of the bead. Yet when the water has arrived at a certain height the bead ceases to be visible. Upon the same property depends the operation of the lenses of microscopes and refracting telescopes.

Such being the effect of simple refraction, we may return to the consideration of double refraction. In this two images are produced, and neither are in the direct line which the ray would have pursued if the double refracting body had not been interposed. Moreover, it will be found that one of the images is not even in the same plane with the incident ray. It will be found on examination that at a perpendicular incidence, as when we look directly downwards through the Iceland spar, there is no deviation of one of them; whilst at any other incidence, as when we look obliquely, the ray is bent towards the perpendicular, the sides of the angles and refraction preserving the constant ratio of 1·654 to 1, and these angles being always in the same plane. This ray being refracted according to the known law, is called the ordinary ray. If, however, we examine the other ray, the deviation at a perpendicular incidence, instead of disappearing, will be found to be 6° 12′; and that at other incidences, this second ray does not follow the law of the sines. Moreover, the planes of the angles of incidence, and refraction are different. For these reasons this second ray is called the extraordinary ray.

It appears that if a ray is transmitted along a certain direction in any double refracting crystal, it is not divided. This direction has reference to the optic axis of the crystal. In Iceland spar the line connecting the obtuse solid angles of the rhombohedron is the axis of the crystal, and if we suppose a mass of spar to be subdivided into its elementary molecules, which are all rhombohedrons, the axis of each will be an optic axis. The optic axis of the crystallized mass is, consequently, a direction in space parallel to the axis of the elementary molecules, and is equally inclined to the three faces containing the obtuse solid angle. Now, it has been found that all the phenomena of double refraction are symmetrical round this line. If we polish an artificial face on the crystal perpendicular to the optic axis, and mark the course of the refracted ray, we shall observe that when the ray is incident perpendicularly on this face, or on the direction of the axis, it undergoes no deviation by refraction, and the ordinary and extraordinary rays coincide; whilst for every other incidence the ray is divided, the refracted rays being both in the plane of incidence, and the deviation of the extraordinary ray being less than that of the ordinary ray. Moreover this deviation of the extraordinary ray, and, therefore, the ratio of the sines, is the same for all rays equally inclined to the axis, whatever the azimuth of the plane of incidence may be. The ratio, however, of the sines of incidence and refraction of the extraordinary ray is not constant, but diminishes as the inclination of the incident ray to the optic axis increases, being least of all when the ray is perpendicular to the axis. This least value of the ratio is termed the extraordinary index.

The plane of incidence in these cases contains the optic axis, and the extraordinary ray continues as before stated in that plane. If we look obliquely through a piece of Iceland spar at a spot on a sheet of paper, the extraordinary image will be seen to revolve round the other as the spar is turned on the paper, and will arrive twice on the plane of incidence, viz., when that plane contains the optic axis. When the plane of incidence is perpendicular to the optic axis, a similar coincidence of the two planes occurs; but in this case the ratio of the sines of incidence and refraction of the extraordinary is constant, so that this ray, then, satisfies both the laws of ordinary refraction. This constant ratio is the extraordinary index already mentioned.

In Iceland spar, the extraordinary index is less than the ordinary, and the extraordinary ray is therefore always refracted from the axis. But there are many double refracting crystals in which the extraordinary index is greater than the ordinary, and in these the extraordinary ray is refracted towards the axis. Again, whilst in some crystals there is but one optic axis, or one direction only along which a ray will pass without division, the greater number of crystals possess two optic axes. Thus, crystalline bodies may be classed with regard to their action on light, into 1, single refracting crystals; 2, uniaxial crystals; and 3, biaxial crystals. The first belong to crystals whose fundamental form is the cube; the second to the rhombohedral or to the pyramidal system; and the third to some one of the prismatic systems.

Although it was at one time supposed that one of the refracted rays in every crystal followed the ordinary law of the sines, while the other was refracted according to the law which Huyghens explained by an elegant construction,—it has since been shown that this is not really the case, and that in biaxial crystals both rays are refracted in an extraordinary manner, and according to a new law.

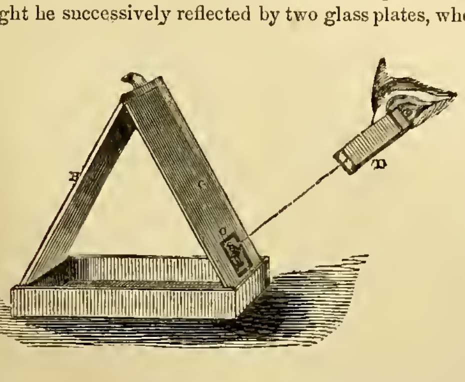
One of the images of an object seen through a double-refracting crystal always appears nearer than the other, and experiment will show that the difference of the apparent distances varies with the thickness of the crystal and with the obliquity of the ray. The explanation of this effect is this: when an object is seen through a denser medium, bounded by parallel planes, the image is nearer to the surface than the object; the difference of their distances being to the thickness of the medium as the difference of the sines of incidence and refraction to the sine of incidence, and, therefore, the distance between the object and its object increases with the refractive power of the medium. Double refracting crystals having two refractive indices—there will be two images at different distances from the object. When the ordinary image is greater than the extraordinary, the ordinary image is nearer than the other, and when the extraordinary image is the greater, the reverse will be the case.

We now approach the phenomena of polarisation. A ray of light which has undergone reflection at a given angle, is found to have acquired properties quite distinct from ordinary light. For example, whilst ordinary light is equally reflected in every azimuth of the plane of reflection, the intensity of a reflected ray, after it has again suffered reflection, diminishes as the angle between the reflecting planes increase; and it entirely disappears, the ray being wholly transmitted when the plane of reflection at the second surface is perpendicular to that of the first. Again, when a ray of solar light has suffered double refraction after passing through an appropriate medium, the two portions of the divided ray are of equal intensity; but if they are transmitted through a second double refracting body, the two parts into which each is subdivided, are no longer equally intense. Their relative brightness depends on the position of the second refracting medium with respect to the first, and in two positions one of the rays entirely vanishes. The light which has been dealt with in this way is termed polarised, from its theoretically possessing sides or poles. A polarised ray has the following properties: 1. In two positions (with respect to the ray) of the principal section of a double-refracting crystal through which it may be transmitted, it is not divided into two pencils. When the plane of polarisation (*i.e.*, the plane of reflection at which the effect is produced) coincides with the principal section, it is refracted in an ordinary manner, but when it is perpendicular thereto, it is reflected in an extraordinary manner. In other positions two pencils are visible, and these vary in intensity according to the position of the principal section. 2. A polarised ray is not reflected at the surface of a transparent medium when that surface is inclined to it at a certain angle, and in a plane of incidence perpendicular to the plane of polarisation. It is partly reflected when the reflecting surface is presented in other planes of incidence, or at different angles. 3. A plate of tourmaline, a crystal of the uniaxial class, will not transmit a polarised ray when the axis of the crystal is parallel to the plane of polarisation. As the axis of the crystal is turned from that position, the ray is transmitted with increasing intensity.

With the exception of the metals, all reflecting surfaces have the power of polarising light, every substance having its own angle of polarisation. For example, that angle in the case of water is 53°, and in the case of glass 57°. It has been found that the refractive powers and the polarising angles of bodies are connected in a remarkable manner, and this law has been ascertained; the index of refraction of the substance is the tangent of the angle of polarisation—or it may be expressed thus, the angle of polarisation is such that the reflected and refracted rays form a right angle.

A beam of common light may be regarded as composed of two polarised beams of equal intensity, having their planes of polarisation perpendicular to each other. This is a consequence of the law, that when a beam of light is polarised by reflection, and is then allowed to fall upon a second reflecting surface at the polarising angle, the intensity of the twice reflected beam varies with the angle of the planes of reflection, being greatest when these planes are coincident, and = 0, when they are perpendicular.

The differently coloured rays composing solar light having different refractive indices, it follows, as a consequence, that all the rays of the spectrum are not polarised at the same angle. If a beam of ordinary light be successively reflected by two glass plates, whose planes of reflection are at right angles, some part of the reflected beam will always be visible in the shape of red or blue rays, according as the angle of incidence is the polarising angle of the more or of the less refrangible rays. To show the curious phenomenon of polarisation, a little apparatus has been invented by Mr. Bestall, of 1 Victoria Cottages, Kensington Park, London. This consists of a polarising mirror, glass stand, and analysing tube, all made of a simple form, so as to be sold at a low sum. This apparatus, with a selection of carved selenite plates, will be found very suitable for schools, or for classes studying the properties of light. It is represented by the accompanying cut. A, is a box holding a flat blackened mirror; B, is a sheet of ground glass; C, is a sheet of transparent glass, upon which the selenite object, O, is placed. B, being turned towards the light so that the rays may fall upon the mirror at the proper polarising angle, these rays are reflected through the selenite object, which should then be looked at through the tube, T. As this tube is revolved by the hand round its longer axis, the colours of the object are continually changing. The selenite may be cut with the figures of birds, fruit, flowers, or butterflies, which will then pleasingly display the primary and complimentary tints on their different parts. The analysing tube contains a series of glass plates, parallel to each other, which, on being placed in their case, assume the proper angle for the transmission of the polarised rays to the eye. The ground glass and transparent glass plates are so contrived that when the apparatus is not required for use, they fit into the box holding the blackened mirror, and when raised out of it they are inclined at the proper angle over the mirror for the display of the phenomenon.



GATHERING AND SEWING MACHINE.

Amongst the numberless modifications and applications of that extremely useful invention—the sewing machine—it appears that one of a very desirable character has been hitherto overlooked. We allude to a contrivance for making gathers in fabrics, and firmly sewing the plaits simultaneously. We have now to call attention to a machine derived from America, and recently patented in this country by Mr. J. Henry Johnson, for executing this novel work. The machine is of a very simple form, and is capable of being combined into almost every description of sewing machine. It will make every kind of gathered work, whether frills, ruffles, flounces, or plain gathering, and will either gather and sew the work simply on itself, or gather and attach it, at one operation, to a piece of plain fabric. Its workmanship is particulary neat and uniform, but capable also of being varied at will as regards the length of stitch and fulness of gather. All kinds of fabric may be operated upon, whether silk, cotton, linen, or woollen, and even such an article as leather, if sufficiently thin and flexible.

Gathered work, as hitherto made, has always been attended with this objection, that, until it was stitched down to another piece of cloth, the gathers would slip about on the thread just as beads would run along a string. The gathers made by this mechanism, however, are separately secured, and tightly held apart, so that no kind of slip is possible. The stitch will depend, of course, upon the class of the sewing machine employed, for any kind of stitch may be used.

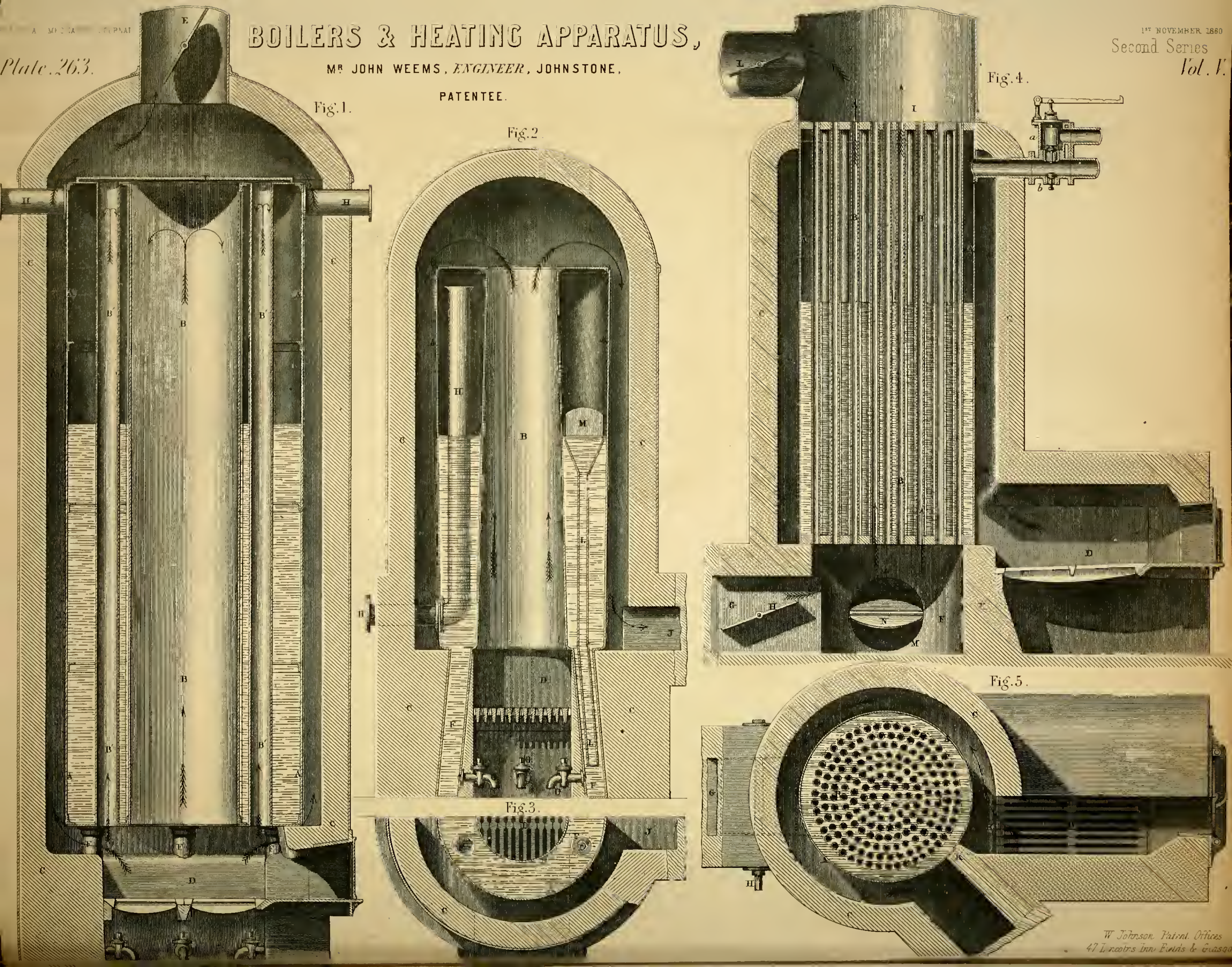
The apparatus used in producing a piece of gathered work, when the same is simultaneously attached to a piece of plain cloth, consists of a peculiar mechanism for gathering, or feeding, or moving forward, one of the fabrics operated upon, which peculiar mechanism is used in combination with a sewing machine, the latter being modified to receive the additional mechanism. The feeding mechanism of the combined machinery is formed of two parts. One of these parts, which may be termed the Gatherer, performs the operation of gathering one of the two pieces of cloth, and at the same time moves it forward to the place where it is brought into contact with the other piece of cloth. At this place the two pieces are sewed together by the operation of the sewing mechanism of the sewing machine, and the united fabrics are then moved forward by the second part of the feeding mechanism which belongs to the sewing machine. The action of the Gatherer is assisted by a metal plate, which performs the double office of retaining the under piece of cloth in contact with the roughened surface of the Gatherer, in the process of gathering and of keeping the two pieces of cloth apart until brought into contact at the proper place for the purpose of being united.

The accompanying woodcuts will sufficiently explain this invention. Fig. 1 is a vertical section of the mechanism, showing a sufficient portion of a sewing machine to illustrate the operation, and fig. 2 is a plan of the same with the cloth plate, I, removed. A, is the standard, or that portion of a sewing machine which supports the cloth plate, I. N, is the needle, and, C^1, the shaft from which the various motions of the machine are derived. C, is an eccentric pin or crank in the end of the shaft, C^1, which gives motion to the feeding mechanism, and to which is attached the looping hook, when the sewing machine employed has such a looping hook. B, is a slide, so attached to the standard, A, by the pin, H, that it is free to move thereon in the direction of its length, and also to turn around the pin, H. There is an opening or slot made through B, in which the eccentric pin rotates. This opening is of a width which nearly fits the eccentric pin at C, but its length is such that C can, under certain circumstances, play thereon, giving the slide, B, but little or no motion in the direction of its length. The other end of B is hollow,

BOILERS & HEATING APPARATUS,

MR JOHN WEEMS, *ENGINEER*, JOHNSTONE,

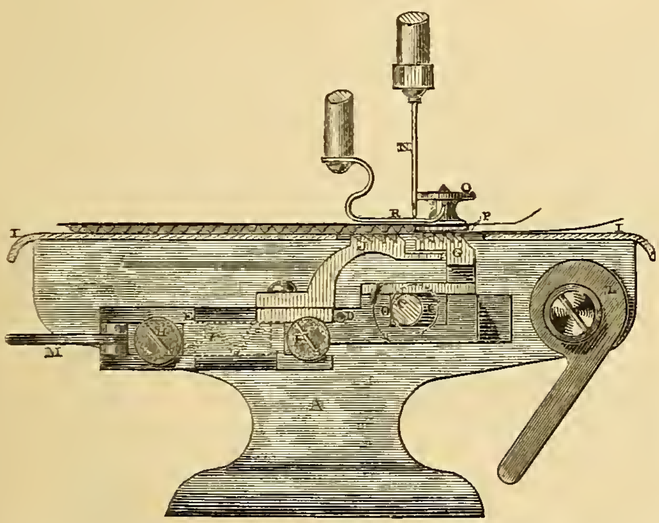
PATENTEE.



W. Johnson, Patent Offices
47 Lincoln's Inn Fields & Glasgow

and a spiral spring, *b* (fig. 2), is inserted therein, which presses against the pin, H, and tends to force B towards the eccentric pin, C, and keep the latter in contact with the end, *o*, of the slot. A cam, L, supported by the standard, A, regulates the extent of longitudinal motion to which B can be subjected. To the slide, B, is attached a roughened or serrated plate, G, which passes through an opening in the cloth plate, I, at a point in front of the needle, N, when the slide, B, is raised by the eccentric pin, C. The serrated plate, G, then moves forward, carrying along with it the cloth placed thereon to the full extent of the motion of B. By the side of the slide, B, a somewhat similar slide, E, is placed, turning also upon the pin, H, and so attached to B by the pin, F, as to be capable of moving in the direction of its length, but to a smaller extent than B. In all other directions its motions are controlled by those of the slide, B. This slide, E, is actuated in one direction by the pin or projection, D, formed on the slide, B, and in the other by a spiral spring, *e*, and the amount of its motion is regulated by the cam, M, attached to its end by the pin, M. The pin, F, which passes through a slot in the slide, E, is made eccentric at the part where it enters the slide, B; the object of which will be shown hereafter. To the slide, E, is attached another roughened or serrated feeding bar, J, which projects through a slot in the cloth plate, I, on the side of the needle opposite to the Feeder, G, and this feeding bar, J, takes hold of the fabrics after they have been sewed together, and draws them along. As the eccentric pin, C, revolves in the direction of the arrow from the position shown in fig. 1, both Feeders are lowered from contact with the cloth, and they follow the eccentric

Fig 1.



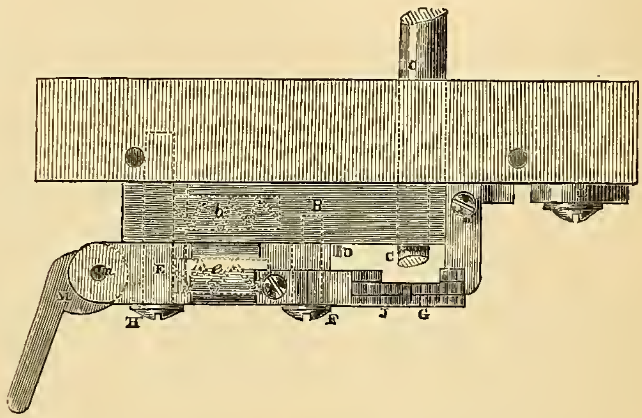
by the force of the springs, *b* and *e*, until the cam, M, strikes the pin, H, when the slide, E, remains stationary, and the slide, B, moves on until it strikes the cam, L. If, then, the eccentric pin, C, has not finished its stroke, it moves on independently of B, and raises both the roughened surfaces, C and J, into contact with the cloth until in its return motion it strikes the end, *o*, of the slot in which it works, and forces the slide, B, along, carrying with it the cloth to be gathered. When by the motion of B the pin, D, which is fixed therein, strikes the slide, E, the latter is carried with B until the end of the stroke, and the parts are again in the position shown in fig. 1.

Upon the upper surface of the cloth plate a plate is secured at one end by a screw, the other end of which plate lies upon or over the gathering feeder. R, is the usual spring pad or presser foot of the sewing machine for holding the fabrics down as they are fed through the machine.

The operation of this machine is as follows:—When a piece of cloth is to be gathered and sewed to another piece of plain cloth, the cam, M, is so turned as to give to the slide, E, a shorter throw than that of the slide, B, and the cloth to be gathered is placed between the Separator and the Gatherer, whilst the other piece of cloth lies upon the Separator, and is subjected to the operation of the feeding mechanism of the sewing machine alone. The result of this is, that the Gatherer, G, takes hold only of the under piece of cloth, which is pressed against it by the Separator, P, and moves it forward for a certain distance, before the Feeder, J, at the other side of the needle begins to move. Thus a gather or plait is made in the under piece of cloth, and this plait is thereupon penetrated by the needle, and secured by the thread to the plain piece of work. After this the stud or pin, D, strikes against the slide, E, and the Feeder, J, is thereupon moved forward, carrying the plait or gather away from the needle, and tightening the stitch. Since the two pieces of cloth come into contact between the presser foot and the Feeder, J, after they have passed the Separator, they will move forward together, the stroke of the Feeder, J, regulating the length of the stitch, whilst the excess of motion of the Gatherer, G, determines the amount of gather put into the lower piece of cloth. It will be seen that the Separator, P, prevents the upper piece of cloth being acted on by the Gatherer.

It may be necessary, in some cases, to vary the height of the feeders, J and G, relatively to each other, in order that they may bear equally upon the material. This is readily accomplished by turning the pin, F, which, by its eccentricity, will raise or lower the feeder, J, as required. By increasing the travel or throw of the slide, B, whilst the travel of the slide, E, remains the same, the fulness of the gathers can be increased at pleasure, and by diminishing the travel of E, whilst the travel of B remains the same, a similar effect is produced. In the first case the stitche remain unaltered, whilst, in the latter case, the stitches are shortened in proportion as the gathers become more full. Either of these modes of operating may be adopted, or both may be combined by dividing the change between the two cams, L and M, and turning one cam a little in one direction, and the other cam a little in the other direction, a perfect

Fig. 2.



control of the operation being maintained by these cams, so that the fulness of the gathers may be varied indefinitely whilst the work is going on. This mechanism is also applicable to the making of gathered work of all kinds, which is not attached at the time of the making thereof to another piece of fabric, but is simply gathered on itself, the plaits or folds being firmly secured by means of a single series of stitches. In this case the single piece of fabric to be gathered is placed on the two feeding surfaces, and beneath the Separator as well as the presser foot, motion being communicated to the combined mechanism in the ordinary way, the fabric will be thereupon gathered on itself and securely stitched, so that the plaits or folds will not slip along the thread, but be tightly held together.

When it is desired to use the machine for ordinary or ungathered work, the Separator, P, should be removed, and the cams, L and M, should be so adjusted as to give to the Gatherer, G, and Feeder, J, an equal amount of throw. It will be evident that two or more pieces of fabric may be simultaneously gathered by means of this mechanism and secured to a piece of plain fabric. In this case, the several pieces of fabric to be gathered must be laid one upon another, and placed between the Gatherer and the Separator.

BOILERS AND HEATING APPARATUS.

Mr. John Weems, *Engineer*, *Johnstone*, *Patentee*.

(*Illustrated by Plate* 263.)

The economical and effective application of the heat evolved from burning fuel has been a problem to which a legion of engineers have devoted their attention since the days of James Watt, whose improvements all tended towards this important point. Steam generators have been arranged in a thousand different ways, with a view of absorbing to the utmost extent the heat applied thereto. All these varied modes clearly demonstrate that we are yet far from perfection, and that a considerable amount of useful heat is allowed to escape from which no benefit is derived. In the accompanying plate, 263, we have shown some arrangements which have been recently protected in this country by Letters Patent. With a view of utilising to the greatest extent the heat evolved from the furnace, Mr. Weems forms one or more chambers or heat reservoirs in the boiler itself, or external thereto, these chambers are wholly or partially closed at the upper end, retaining the heat and preventing its too rapid escape to the chimney. This arrangement for confining the heat at the upper part of the boiler, is also atttended with the advantage of superheating the steam without involving any special apparatus or arrangement for the purpose. The invention also comprehends a system of apparatus for heating and ventilating buildings, which is about to be carried out on an extensive scale in some of the public buildings at St. Petersburgh. We have engraved two modifications of Mr. Weem's vertical boilers, and one arrangement of the heating and ventilating apparatus.

Fig. 1, on plate 263, is a vertical sectional elevation of a steam generator, adapted for motive power and other generally similar purposes. In this modification of the patentee's improvements, the boiler, A, is arranged in a vertical position, and as compared with its diameter, it is of considerable height. The boiler is of an annular figure, having a large central tubular passage, B, and a ring of small tubes, B^1, round it, extending completely through it. The boiler is arranged within the cylindrical structure of brickwork, C, the central tubular opening being over the furnace, D, which is built within the lower and contracted portion of the brickwork. The upper part of the brickwork extends inwards, forming a cupola through which the funnel or chimney, E, rises. The lower extremity of the boiler has riveted to it the vertical pipes, F; in this modification there are three of these pipes, but any other convenient number may be applied These pipes open into the body or annular portion of the boiler, and they serve as receptacles for the sediment which is deposited by the water. The earthy impurities which are in the water settle down and collect in the pipes, F, which are to a great extent beyond the influence of the heat of the furnace. The advantage of this arrangement is, that the solid sedimentary matters as they are thrown down do not collect on that part of the boiler which is exposed to the action of the heat, which causes these solid matters in boilers of the ordinary construction to adhere firmly to the boiler, forming a hard non-conducting material, interposed between the heat arising from the fuel, and the water to be heated. The sedimentary matters are drawn off from the pipes, F, from time to time by means of the taps, G, or other convenient valvular apparatus. Another mode of arranging these hollow columns, is to cast the lower part of the boiler with four columns arranged in a rectangular figure. These columns are united in pairs at the sides of the furnace, D, by means of a solid or open web of metal, which is protected internally by the brickwork or other non-conducting lining of the fire place. Opening out from the upper end of the boiler, A, in a lateral direction are the steam pipes, H, to one of which is fitted a safety valve; they convey the steam to the engine or other purpose for which it may be required. The central and small tubular passages through the boiler are closed at the upper end by a cast-iron plate, or fire-clay slab, I. The object of this arrangement is to check the heated current as it rises from the furnace, and prevent it from passing away through the boiler before its heat is imparted to the surrounding metal which partially encloses the water. This closing of the upper opening causes the cylindrical passage, B, to form a chamber or receptacle of heat, and this distinctive feature in the arrangement forms an important portion of the invention. The heat as it ascends into the chamber, B, being checked in its egress, besides more effectually heating the surrounding water, serves also to impart an additional quantity of heat to the steam contained in the annular space above the water. After ascending to the top of the chamber, B, and tubes, B^1, the heated current and gaseous matters descend and pass up round the exterior of the boiler, and away out by the chimney, E, as indicated by the arrows. In this way the full heating properties of the burning fuel are utilised before the gaseous current is allowed to reach the chimney. Fig. 2 is a vertical section showing another arrangement of a vertical boiler. The right and left hand portions of the boiler delineated in fig. 2, are sectioned in different planes, so as to show clearly two of the hollow legs or columns on which the boiler stands. In this modification, the boiler, A, is of an annular figure, but the central opening, B, is of a tapering or conical form, so that the heat as it ascends from the furnace, D, impinges against the converging or slightly overhanging sides of the opening, B. The boiler is enclosed by the structure of brickwork or other suitable material, C, the cupola or dome of which is built without any opening. The heated current therefore ascends from the furnace to the dome, imparting its heat to the interior of the boiler; at the upper part the current passes downwards outside the boiler to the lower part, where it passes off by the lateral flue, J, to the chimney. In this circuitous path which the gaseous current is caused to take, the heat is fully abstracted therefrom before it reaches the chimney. The lower part of the boiler, A, opens into the slightly diverging tubular legs, F, in which are fitted the cocks, G, for drawing off the sedimentary deposit. In addition to this arrangement there is also fitted in this boiler a scum collector for arresting the lighter floating particles and causing them to descend. This scum collector consists of the pipe, L, which is carried down into one of the tubular legs, F; the upper end of the pipe is of a funnel shape. In this part there is fitted a vertical metal plate, M, which is carried down into the funnel part of the apparatus; the plate extends very nearly across the space between the shell and the internal part of the boiler. The surge or ebullition of the water, causes the scum or frothy impurities to float against the plate, M, by which they are arrested and caused to descend the pipe, L, and deposited in the tubular leg, F. The steam-pipe, H, is brought down and carried out in a lateral direction. This form of boiler owing to its general arrangement, is exceedingly well adapted for superheating the steam, as a body of highly heated vapour collects in the closed dome, and imparts its heat to the upper part of the boiler. Or an ordinary egg ended boiler may be economically arranged on end as in figs. 1 and 2, and the brickwork around it being built in so as to converge towards the top, the partially enclosed space forms a heat chamber or receptacle. Fig. 3, is a half sectional plane taken below the water level and through the flue, J. The patentee's improvements are also applicable to horizontal egg ended boilers. Under this modification, the boiler has formed in it vertical tubular passages, which extend through the shell of the boiler. The boiler is supported laterally on brickwork, which is built in, so as to divide the space surrounding the boiler into two flues, extending longitudinally, with the upper and lower surfaces of the boiler. The heat evolved from the burning fuel in the furnace, passes along beneath the boiler, and in its progress it also ascends into the heat chambers or spaces. These chambers are closed at the upper part by fire-clay slabs, so that the confined heat is imparted to the surrounding water spaces. The return current passes round the backward end of the furnace, and returns over the upper surface of the boiler to the front end, where it passes away by a lateral flue to the chimney. By the arrangement of the vertical chambers, a large amount of heat, which, would otherwise be allowed to escape into the chimney, is utilised, and at the same time the steam is also superheated by the presence of the highly heated vapour in the upper part of the several chambers. Figs 4 and 5, represent a sectional elevation and plan of a stove or heating apparatus adapted for heating buildings. This modification consists by preference of a cylindrical metal shell, A, in which are arranged a number of vertical tubes, B, these tubes open out through the ends of the shell, A, and the water is contained in the boiler, A, all round the outside of the tubes, and is fitted with a pressure and vacuum safety valve at *a* and *b* The apparatus is arranged on end in a brickwork or other suitable casing, C, at the lower part of which is the furnace, D, this part of the brickwork or casing is divided off from the space below the cylinder, A, by the partition or bridge, E. The space, F, immediately below the cylinder, A, communicates by the lateral passage, G, with the external air. In this passage or duct is fitted a damper or valve, H, for controlling the admission of the external air. The upper ends of the tubes, B, open into the chamber, I, which communicates with the room or series of rooms to be heated. The heat of the burning fuel or other heating medium, traverses round the cylinder, A, and after imparting its heat thereto, escapes by the lateral passage, J, into the chimney. This heating current is prevented from passing at once into the passage, J, by the intervention of the wall or partition, K, which causes the current to make a complete circuit round the cylinder, A, before it reaches the egress aperture. These stoves may be made very portable, and used for drying new buildings, desiccating materials, heating greenhouses, and for various other similar purposes, and where gas is readily obtainable, it may be used as the heating medium. The current of pure air flows in through the inlet passage, G, and passes up through the tubes, B, where it gets heated, and from the chamber, I, it is conveyed by the pipe, L, to the part where the heat is required. The current of heated air after circulating through the apartments or places to be heated, may, if found desirable, be caused to return back to the chamber, F, below the heating apparatus, and so made to circulate again through the tubes, B. The return current of air passes back to the inlet chamber, F, through the tubular way, M, the passage of which is controlled by the damper or valve, N. The opening and closing of this damper or valve, N, as well as the others which are used in conjunction with these improvements, may be arranged to act automatically, so as to admit or allow of the egress of a given quantity or predetermined volume of cold or heated air to pass through or away from the apparatus. The space around the tubes, B, may also be rendered available for heating water or generating steam, or these water or steam spaces may be arranged concentrically if such a disposition of the parts isdesirable. These several improvements are adapted for raising and superheating steam under the most economical conditions, as well as for the useful application of heat evolved from the combustion of fuel or gas.

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HISTORY OF THE SEWING MACHINE.

ARTICLE XXXII.

William Edward Newton obtained provisional protection on the 12th of February, 1859, for certain improvements in sewing machines, relating, firstly, to the mode of drawing the thread through the fabric, after the stitch has been completed, and the required tension given to it. For this purpose, the needle is double pointed, and made to pass back and forth through the fabric, and is caught and held at each operation by suitable holding instruments. The loose or free end of the thread is drawn through the fabric by means of a hook, or hooks, attached to a travelling endless band. Secondly, to a mode of alternately gripping and releasing the needle from the needle bars, as it passes back and forth through the fabric, carrying with it the threads to form the stitches. Thirdly, to a peculiar arrangement of adjustable presser foot, capable of answering the two-fold purpose of guiding the needle to the upper needle-bar, and pressing the thread against the needle, in order to give the necessary tension or tightness to the stitch. By suitably adjusting the feeder and parts in connection with it, this machine can be made to perform any ordinary stitching produced by hand.

John T. Jones obtained a patent on the 15th of February, 1859, for improvements in sewing machines. Our readers will find a full description and illustration of this invention at page 259, vol iv., second series. We find, however, that the patent was granted to John T. Jones alone, and not in co-partnership with Mr. Simpson, as might have been inferred from the notice above referred to.

A patent was granted to Frederick W. Parker, on the 5th of March, 1859, for improvements in sewing machines, which improvements relate both to single and two thread machines. According to this invention, a peculiar hook, or looper, is employed for catching the loop of the needle thread, and holding it in such a position as to allow of the needle again passing through it on its next descent, thereby forming the chain-stitch. When two threads are used, the hook, or looper, is of a modified shape, and passes a loop of the lower thread through that of the needle thread. Fig. 207 represents a front view of the looper, as used in the production of a single thread chain, or tambour stitch. This looper, *c*, is carried on the end of a rocking shaft, *d*, and is made to advance, so as to catch and extend the loop of the needle, D, and hold it in position for being entered by the needle on its next descent. When the needle has thus entered the loop, the shaft, or spindle, which carries the looper slides endwise, slightly and partially turns on its axis, so as to bring the looper back again to its original position. Figs. 208 and 209 represent a front view and plan of the modified form of looper, as adapted for producing a two thread stitch. This looper, *c*, is mounted on a spindle, *d*, as above described, but its hook is inclined or curved, as shown in the plan, Fig. 209, and consequently it moves or glides along close to the needle. The hooked part is made longer than in the previous arrangement, and its bend or elbow does not pass beyond the needle. An eye is formed at the end of the looper, through which is passed the second or under thread. The action of this looper is as follows:—The needle, D, descends, and in again ascending its thread bows out into a loop, into which the looper passes with its own thread. The needle now rises and leaves its loop on the looper. The work is then advanced one stitch, and the needle again descends, passing between the second thread and the looper. The looper now moves back and releases the previous needle loop, but at the same time leaves a loop of the second thread round the needle and in the loop of the first thread which is drawn tight by the descent of the needle. Each thread is thus looped into the other thread, forming a kind of double chain, or Grover and Baker stitch, on the underside of the work, and a single thread similar to plain stitching on the upper side. The patentee has filed a very voluminous specification, and two sheets of elaborate drawings to illustrate this very simple contrivance, whereas our readers will find that the three small cuts annexed, fully illustrate Mr. Parker's claim, which is "the construction and application to sewing machines of a looper, having the peculiar motion or motions, and acting in the manner or manners hereinbefore described."

Fig. 207.

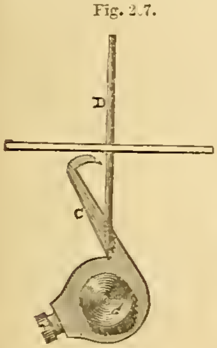
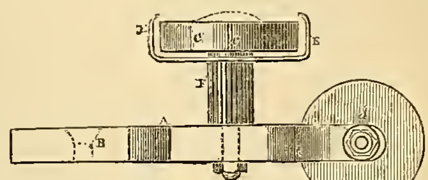


Fig. 208.

Fig. 209.

George Hazeltine obtained a patent on the 5th of April, 1859, for a peculiar arrangement of sewing machine, whereby the ordinary shuttle stitch and a peculiar knot stitch may be produced at pleasure in one machine without changing the parts, it being simply requisite in changing the stitch to drive the machine the contrary way. The needle is supplied with thread from a reel or bobbin and the lower thread is obtained from a stationary thread case placed in a horizontal position in a recess in the table immediately in front of the needle. The stitches are formed by the aid of two arms or hooks attached to a pinion and revolving horizontally round the thread case, such motion being obtained from a sliding rack which gears into the pinion above referred to, and is driven by means of an eccentric on the main shaft. Fig. 210 represents a detached side elevation of the stitch producing mechanism which works in conjunction with the needle, such needle being either curved or straight. Fig. 211 is a plan of this mechanism. A, is a plate or bracket which is to be secured by the screw, B, to the underside of the bed plate or table of the machine. Into this bracket is fitted the vertical spindle of the "receiver" or thread case holder, C, a separate side view and plan of which is given at Fig. 212. Upon this "receiver" is placed the thread case, D, shown at Fig. 213, and round this case travel by a reciprocating circular motion, the two hooks, E E[1], shown detached at Fig. 214. The shanks of these hooks are secured to the pinion, F, which latter rotates freely on the spindle of the "receiver," a reciprocating circular motion being imparted to it and the hooks by a rack gearing into the teeth of the pinion. The needle as it descends enters a hole, *c*, in the edge of the "receiver" and the arms of the hooks pass beyond the needle and catch its thread on the side of the needle farthest from the thread case. The adjustment of the hooks as regards the needle is effected by means of the adjusting screw, *d*, by turning which the bracket, A, may be moved to or from the needle. Having caught the needle thread the hook carries it in the form of a loop round the thread case, and then casts it off, thereby causing the interlocking of the two threads, and producing a locked stitch. If the needle thread be caught by one of the hooks, and is carried round the thread case in the same direction as the feed of the material, the ordinary shuttle stitch will be produced, but if the machine be reversed, then the opposite hook will come into action and will draw the needle thread round the thread case in an opposite direction to the feed of the cloth, and will then produce a peculiar knot stitch. This knot stitch is not at all clearly described in the specification, or we would have given a diagram of it. In order to ensure the feed motion coming into action at the proper time on the reversal of the machine, the eccentric which works the feed mechanism is made to turn on its shaft or reverse itself after the manner of the eccentrics of a steam engine when reversing the engine. By this arrangement the forward feed motion will always be given at the same time in relation to the stroke of the needle whichever way the machine may be driven. We do not recollect ever seeing a sewing machine before which was capable of producing two distinct kinds of stitches by simply

Fig. 210.



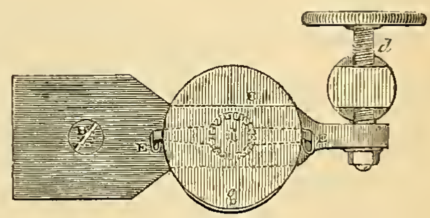


Fig. 211.

Fig. 212.

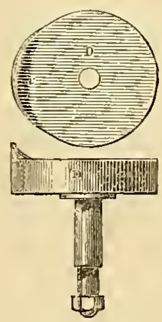


Fig. 213.

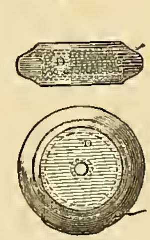
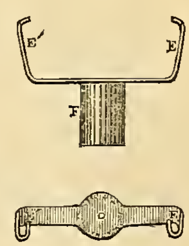


Fig. 214.



reversing its motion, and whatever its utility may be, we think its novelty is undoubted. Such a machine might be found advantageous in the production of such work as necessitates certain parts to be very firmly stitched whilst other parts may be more lightly sewed. The knot stitch is said to be peculiarly adapted to all work wherein great strength is required, and when this stitch is employed no hand labour or back stitches are necessary for perfectly securing the ends of the thread.

Edward Clark obtained a patent on the 21st of April, 1859, for an invention communicated to him by I. M. Singer, of New York. The first part of this invention consists of a peculiar mode of securing two or more needles in the needle carrier, or slide, of sewing machines. This is accomplished by means of blocks, *a*, (Fig. 215,) grooved on their parallel faces to receive the shanks of the needles, and contained in a mortice, *b*, so as to be capable of being tightened up by turning the pinching screw, *c*. The annexed figure is a plan of the bottom of the needle carrier, and is shown as capable of holding four needles. The space between the needles can of course be varied by removing the blocks and inserting others of different thicknesses. When sewing seams or uniting the edges of two pieces of cloth by the aid of two parallel needles, the two cloths to be joined are placed over the edges of guide plates, as shown in fig. 216, one needle passing through one cloth and the other through the second cloth. The stitch is formed by passing a shuttle thread through the loops of both needles, the course of the shuttle being parallel to the two needles and consequently the shuttle passes through both loops in succession. When a double pointed shuttle is used so as to pass through the loops both in its forward and backward traverse, the stitches will present the appearance shown in fig. 217 on the underside of the seam; *a*, being the stitches or loops of the needle threads, and *b*, the shuttle thread which locks them. When a single pointed shuttle is used, so as only to pass through the loop in one direction, as is usually the case in shuttle machines, then the appearance of the underside of the seam will be that shown at fig. 218. In order to prevent the cloth from being drawn or puckered up by the tightening of the shuttle thread between the two needle threads, the inventor uses metal tongues which press upon that portion of the cloth contained between the two needles, which tongues are so shaped as to allow the shuttle thread to slip easily over the end thereof as the work proceeds. Another part of the invention consists in combining with two or more eye pointed needles a vibratory thread carrier, which, after the needles are drawn up, carries a single or compound thread or cord, or braid across, on the upper surface of the cloth and in front of the needles or needle threads, so that when the feed motion advances, the cloth and the needles are carried down to make the next stitches; they descend in front of the thread, cord, or braid, so laid on the surface, and thereby secure it producing the effect shown at fig. 219. The feeding plate has an up and down and horizontal motion imparted to it in a very simple manner, that is to say, by a lever, the fulcrum of which is a universal joint; and the free end of the lever being worked by two cams, the one serving to depress the end of the lever and so elevate the feed plate and cause it to strike the cloth, whilst the other cam pushes the end of the lever laterally, and so imparts the horizontal feed motion to the feed plate. We have some recollection of having already noticed a somewhat similar application of a universally pivoted lever for working a feed motion, but in the case to which we refer, the lever was used for working a feeding foot acting upon the surface of the cloth, after the manner of the feed employed in the "Thomas" machine, whilst here the lever is applied to the roughened plate patented by Grover, Baker, & Co.

Fig. 215.

Fig. 216.

Fig. 217.

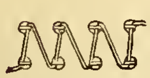
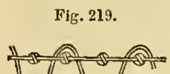


Fig. 218.

Fig. 219.



A patent was granted to W. E. Newton for an invention communicated to him from America, on the 25th of April, 1859. This invention consists of a rather complicated arrangement of shuttle sewing machine. In actuating the needle, a rocker is employed, whereby the needle is slightly drawn back out of the fabric after penetrating the same, so as to open the loop, and afford time for the passage of the shuttle through it. A peculiar mode of working the shuttle driver is described, by which, after the driver has advanced to drive the shuttle through the loop, and before retreating for a new stitch, it makes a slight backward movement and then a return forward movement, the back movement serving to remove the driver from contact with the heel of the shuttle, so that the loop of the needle thread may pass freely over the heel, whilst the return forward movement serves to tighten the shuttle thread simultaneously with the tightening of the needle thread, to complete the stitch. In lieu of the ordinary yielding presser foot, a vertically sliding unyielding bar is employed, in combination with a jointed, holding down, and feeding pad.

Joshua Kidd obtained provisional protection on the 28th of April, 1859, for a sewing machine, capable of producing either a plain or lock stitch, or a loop or chain stitch, by slightly altering the parts. The chief features of this invention appear to be the working of the needle and shuttle by one crank pin; applying keels or guiding strips to the flat and round surfaces of the shuttle, such keels working in grooves in the shuttle race, and thereby steadying and guiding the shuttle with more certainty and accuracy than is usually accomplished in ordinary shuttle machines; the hanging of the feeder on a centre, and working it by the needle arm and needle slide. (There is no novelty in this mode of working the feeder); and the use of a guide bar forming a guide and a regulator for guiding the feeder and regulating the length of stitch.

A patent was granted to Daniel Foxwell on the 12th of May, 1859, for an invention, consisting, firstly, of an improved arrangement of parts for actuating the needle by means of a cam, slide, and rocking lever, and also another slide to which the needle is attached; and secondly, of a peculiar arrangement of mechanism, by which two needles pierce the material on the same side, one after the other, and by means of a peculiar forked instrument, form a novel stitch, of which fig. 220 represents a diagram side view; fig. 221, a top view, and fig. 222 a view of the underside. This stitch, it will be observed, consists of two threads looped one into the other on the surface of the cloth, and producing an appearance similar to the chain or tambour stitch. 3rd, of an improved support or side frame, in which the centres or bearings are surrounded by an ornamental design, so as to combine beauty with utility.

Fig. 220.

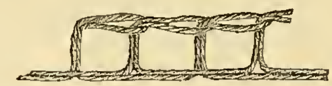


Fig. 221.

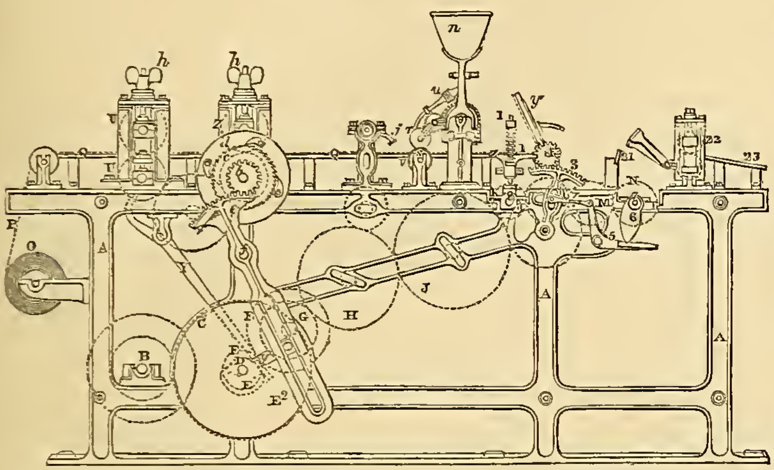
Fig. 222.

PAPER BAG MACHINE.

Among the varied marvels of mechanical art collected under the transparent roof of the Exhibition Building of 1851, no machine attracted more general attention, or exhibited a greater degree of wonder, than M. Remond's envelope making machine, exhibited by Messrs. De La Rue. The neatness, rapidity, and accuracy, with which the complex operations of cutting, folding, and gumming the paper were performed by the delicate, yet unerring mechanical fingers, called forth the unqualified admiration of the spectator. In the present article we desire to direct attention to a machine somewhat analogous to that we have instanced, but altogether differing in arrangement as well as in the article produced. This machine is for making paper bags from a continuous length of paper automatically, or the bags may be made from the paper as it issues from the drying cylinders of the paper making machine. The machine is the invention of Mr. G. Davidson, of Mugie Moss, near Aberdeen. Although a paper bag may appear to many, to be an article sufficiently insignificant to be produced by costly machinery, and yet such is the extent of the demand for these articles among grocers and others, that the suppliers are fain to resort to the rapid manipulations of machinery to meet the demand at the lowest possible price. The machine we have here engraved, is exceedingly ingenious in its arrangement, it creases, pastes, and folds down the paper, with unerring regularity and precision, as well as severing from the length the finished bag.

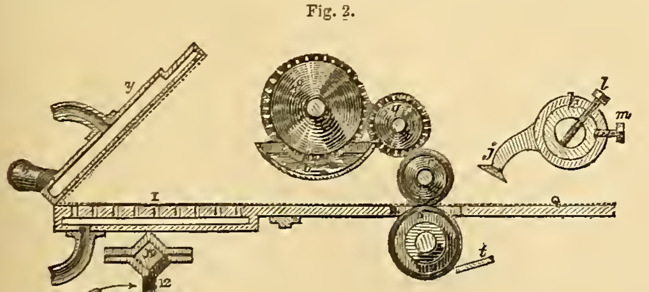
A, is the main framing or side standards of the machine, and B, is the driving or first motion shaft supported in suitable bearings, and fitted with a pair of fast and loose driving pulleys, D. This shaft carries also a spur wheel, which gears into a larger spur wheel, C, keyed on the cam shaft, D, which works in bearings bolted to the main framing; this shaft has also keyed upon it a spur pinion, E, a cam E^1, and disc plate, E^2. The spur pinion, E, gives motion to the train of gearing, F to N, the separate actions of which will be described. O, is the reel of paper to be manufactured into bags. This reel is carried in suitable bearings in brackets bolted to one end of the machine, and the end of the strip of paper, R, which is of the desired width for a bag; after leaving, the reel is passed over the end guide roller, which directs it on to and over the supporting tables, Q. The first process to which this strip is subjected is the longitudinal creasing at the sides requisite for forming the side flaps, R, shown in fig. 3, aud the transverse crease, s, for forming the bottom of the bag. The cutting or nicking of the edges of the strip to enable the flaps to be properly turned over, as shown at T, is also accomplished simultaneously with the creasing of the strip, and these several operations are effected by means of the pair of rollers, U, carried in small standards, bolted to the top of the main framing. The upper one of these rollers is provided with a thin steel disc at or near each end;

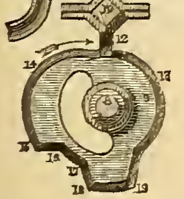
Fig. 1.



the edges of these discs project in the form of annular flanges slightly beyond the surface of the roller, aud are sufficiently sharp only to make a longitudinal crease in each edge of the strip of paper without actually cutting it. The transverse crease, s, is formed across the strip by means of the blade, v, figs. 4, 5, fitted into a longitudinal groove made in the surface of the roll, and secured therein by a key or wedge, as shown more clearly in fig. 5, the creasing edge of the blade projecting slightly beyond the surface of the roller. On the opposite side of this roller is another blade, W, similarly fitted, but in place of having a creasing edge, it is provided with a row of perforating pins which perforate the strip transversely, and facilitate its subsequent division when the bag is completed, as will be described. The roller, U, is further provided with V-shaped knives at each end for cutting out the angular notches, T, fig. 3, from the sides of the strip, and with straight knives, on its diametrically opposite side for the purpose of nicking the edges of the strip. The lower roller, U, which should be exactly the same diameter as the upper roller, is provided with soft cushions or pads, X, of vulcanised India-rubber, or other suitable material, upon which the knives and

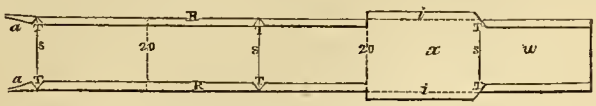
Fig. 2.





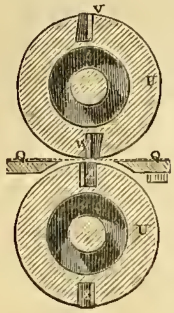
creasers act without having their edges injured. The traverse of the strip between these two rollers is intermittent, and the rollers themselves act as drawers or feeders of the strip. Each half rotation of these rollers creases and cuts or nicks a certain length of the strip sufficient for one side of the bag, after which they make a pause or dwell during the time the folders are acting, and the completed bag is being cut off from the front end of the strip alternately, as herein-after explained. In order to ensure that these rollers make no more nor less than one half revolution before they pause, there is secured to the end of the spindle or axis of the lower roller a check plate having two notches made in its periphery, into which the end of the lever, Y, enters, and acts as a stop or detent to the rollers until released therefrom by the action of the cam, E^1. The end of the strip having been creased and cut or nicked by the rollers, U, passes onwards to the pair of drawing and pressing rollers, Z, which work in the standards similar to those of the rollers, U. These rollers, Z, serve to press or fold over the side flaps which have been raised by the creasing rollers, suitable guides being fitted to the table for the purpose of inclining the raised flaps inwards as they approach the pressing rollers, and thereby insure the flaps being laid or folded over in the proper direction by those rollers, as shown at *a* (fig. 3). The pressing rollers like the creasing rollers make one half revolution, and then pause or dwell. Motion is communicated to them and from them to the creasing rollers in the following manner:—On the axis of the lower pressing roller, Z, are fitted to turn loosely the spur pinion, *b*, and rachet wheel, *c*, the teeth of the latter wheel engaging with a number of palls carried by the pall plate, *d*, which is fast on the axis of the lower pressing roller, Z. A vibrating toothed quadrant, *e*, works on a fixed centre at *f*, and gears with the spur pinion, *b*. This quadrant is actuated by a pin in the disc plate, E^2 working in a slot in the tail of the quadrant, the amount of traverse of which is regulated by adjusting the throw of the pin by means of the adjusting screw, *g*, in the disc plate. When the quadrant makes a stroke in the direction of the arrow, fig. 1, the spur pinion, *b*, and rachet wheel, *c*, which both work together by friction, and carry round with them through the palls the pall disc, *d*, which latter being fast on the axis of the lower drawing or pressing roller, causes it to rotate, making one half complete revolution; the quadrant then moves back again, and rotates the pinion, *b*, and rachet wheel, *c*, in an opposite direction; but as these latter are loose on the roller spindle, and the teeth of the rachet wheel pass freely over the palls without actuating the pall plate, the roller will remain stationary. In order to hold this roller steady during the return of the quadrant and prevent backlash, a rachet wheel is fitted upon its spindle, on which a set of palls act. It will thus be seen that the pause or dwell of the pressing rollers, Z, is due to the back or return stroke of the quadrant. On the extreme opposite end of the spindle of the lower pressing roller, Z, is keyed a spur pinion which drives the upper roller through a corresponding pinion, aud which transmits motion also through an intermediate wheel to a pinion fast on the end of the lower creasing roller, U, the upper roller being driven from the pinion which gears into the pinion fast on the spindle of the upper roller. The motion of the creasing and pressing rollers is thus obtained entirely from the quadrant, *e*, which is driven direct from the second motion shaft, D. The upper one of each pair of rollers is adjusted by the set screws, *h*. The strip of paper after passing between the pressing rollers, Z, has its side flaps doubled inwards, but in order that the paste or cement may be properly applied it is necessary before arriving at the pasting apparatus that the flaps of the after division of the length which forms the bag be opened out or turned back again into the position shown at *i* (fig. 3), in order that the paste may be applied to the outside of one pair of flaps and to the inner surface of the other or after pair. The opening or turning back of each alternate pair of flaps, the patentee proposes to accomplish by means of the fingers, *j*, which descend upon the paper and then move laterally in opposite directions, and by entering beneath the flaps turn them back again into the position shown at *i* (fig. 3). Each finger is made with a large boss, which works or slides freely along the hollow shaft, *k*, within which works an internal shaft. The boss of each finger has two slots formed in it, the one inclined and the other horizontal, and through each slot is passed a pin, the one, *l*, which passes through the inclined slot, being screwed into the internal shaft, and the pin, *m*, which passes through the horizontal slot, being tapped into the hollow shaft only, as shown in fig. 2. The effect of this arrangement is, that when both shafts are partially turned together in their bearings, the fingers will be brought down upon or raised up from the paper, and by then turning the internal shaft aud allowing the outer one to remain stationary, the pins, *l*, by acting upon the inclined slots in the bosses, will cause them to slide along the hollow shaft and recede from each other, so as to unfold or turn back the side flaps. These combined and separate actions of the hollow and internal shafts are derived from the two cams, which operate respectively upon two levers, severally keyed on to the ends of the hollow and internal shafts. Suitable counterweights are employed for keeping the two levers in contact with their respective cams. Motion is imparted to the shaft which carries the cams by means of a pinion keyed thereon and gearing into the pinion, I, which receives motion from the intermediate wheel, H, driven from the shaft, D, by means of the toothed wheels, E F and G. The strip now proceeds onwards to the pasting apparatus, by which the flaps are coated with paste or cement preparatory to the final folding of the end of the strip into a bag. The paste or cement is supplied to the pasting rollers and brushes either directly from the cistern, *n*, or from the trough, *o* (fig. 2), but when paste is used, the patentee prefers to employ the trough. In this trough revolves a pair of circular brushes, *p*, which take up the paste on their surfaces, and apply it to the distributing rollers or cylindrical brushes, *q*. These brushes spread the paste upon the pasting rollers, *r*, against which the flaps are held by the lower rollers, *s*, and cleaned by the scraper, *t*. The rollers, *q* and *r*, are

Fig. 3.



carried in a frame working freely on the axis of the roller, *p*, by which arrangement facility is afforded for throwing them up out of action or contact with the paper when desired. When the cistern, *n*, is used, the cement is conducted on to the roller, *p*, by the supply tube, *u*, and its flow is regulated by the stop-cock. The several rollers of the pasting apparatus are geared together by toothed wheels, so that each roller has a positive motion of its own instead of relying upon friction alone for its motion. The primary movement of the pasting apparatus is derived from the grooved pulley, *v*, fast on the axis of the lower roller, *s*, and this pulley is driven by means of a band, which also drives the delivering rollers herein-after referred to. The strip of paper, having been creased and pasted, is now submitted to the action of the folders. In folding the end of the strip into a bag, three folds must be made, namely, one fold for turning over the extreme end, *w* (fig. 3), of the strip, and laying it flat down upon the part, *x*, which may be accomplished either by the folding plate, *y*, or by a slit and folding knife, and two folds for doubling over the open side flaps, *i*, of the paper on to the part, *w*, which may be effected simultaneously either by the aid of the peculiarly actuated folding bars, *z*, or by folding flaps hinged to the supporting table, after the manner hitherto adopted in the manufacture of envelopes. The folding flap, *y*, is represented in the figures as in the act of folding over the end of the strip; but when at rest it lies in a horizontal position in the same plane with the tables, Q, and forms a continuation thereof, so that the end, W, of the strip will travel on to and lie flat upon its surface, being further held thereon by the action of a vacuum and atmospheric pressure. For this purpose the flap, *y*, is made in the form of a hollow box, the side or face upon which the paper rests being perforated whilst the interior is in communication by means of a flexible pipe with any convenient exhauster or vacuum chamber. The folding table upon which the part, *x*, of the strip lies is similarly constructed, and is also in communication with a vacuum chamber or exhauster through another flexible pipe. The paper is thus securely held in position during the main folding process, and consequently all risk of false folding is obviated. The folding flap, *y*, is secured to a transverse rod, or rocking shaft, 2, the working centres of which are so adjusted in relation to the folding flap and table that the junction between the two, forms the axis of motion, and exactly coincides with the crease, s, previously made across the strip by the creasing rollers, before referred to. Motion is imparted to the flap, *y*, by means of the quadrant, 3, which oscillates upon a fixed centre, and gears into a pinion, 4, fast on the end of the rocking shaft, 3. The quadrant, 2, derives its to-and-fro motion from the bell-crank lever, 5, with which it is connected by a link. This bell-crank is actuated at the required time by the wiper, 6, fast on the end of a transverse shaft, 7, which derives its motion from the carrier wheel, J, through the intermediate wheels, K, L, M, and N; the last mentioned wheel, N, being fast on the shaft, 7. A three-way cock serves to open a communication between the table and folding flap and vacuum chamber simultaneously at the desired intervals, so that the folding having been completed, the vacuum is shut off, and the flap, *y*, is free to rise, leaving the paper folded on the table, and at liberty to move forward under the knife, referred to. For this purpose, the plug of the cock is turned by means of a counterweight lever and cam, so constructed as to time its movements accurately in accordance with the rest of the mechanism. This cam is fast on the end of a transverse shaft, 8, driven by the pinion, K, in gear with the intermediate wheel, J. This shaft, 8, carries also a pair of cams, 9, one of which is shown in fig. 2, which cams actuate the folding bars, Z, for folding over the side flaps of the bag. Each folding bar extends the full length of the side flaps to be folded, and is carried by a rectangular bar, 10, along which it is free to slide towards or from the edge of the strip to be folded. This bar has a hollow vertical boss formed at each extremity, through which pass the two vertical and stationary spindles, 11, and along which the bar is free to slide vertically, a helical spring keeping it down to its lowest position when not otherwise acted upon. Each folding bar, Z, is provided on its under side with a forked pin, 12, which embraces a projecting rib, formed on the surface of each of the cams, 9, the cam surface and rib being so formed as to impart both a vertical and a horizontal lateral motion to the two folding bars. When the pins, 12, rest upon the concentric portion, 13, of the cam surface (fig. 2), the folding bars will remain at rest and at their lowest positions or below the level of the folding table, but when, by the rotation of the cams in the direction of the arrow, the inclined portions, 14, of the cams act upon the pins, the transverse bar, 10, will be elevated along the guide rods, 11, so as to bring the folding bars above the level of the folding table, and push upwards the side flaps of the paper into a vertical, or nearly vertical, position. The rotation of the cams from 14 to 15, now causes the folding bars to slide forward along the bar, 10, and over the edges of the table so as to fold over the side flaps, on to the surface of the part, *w*. The lateral motion of the folding bars is obtained by the lateral divergence of that portion of the rib, contained between the points, 14 and 15, which portion of the cam is concentric, so that no vertical motion will be imparted to the folding bars during their lateral traverse. The passage of the pin from 15 to 16, allows the folding bars to descend on to the flaps, a certain amount of pressure being at the same time exerted thereon by the combined weight of the folding bars and the action of the helical springs, which pressure is sufficient to ensure a perfect contact between the pasted surfaces, and this pressure is maintained during the rotation of the cam from 15 to 17. From 17 to 18, the raising of the folding bars from the paper is again accomplished, when they are drawn back out of the way by the diverging portion of the rib from 18 to 19, and are finally dropped to their lowest position beneath the level of the table by the further rotation of the cams from 19 to 13, which completes the movements of the folding bars, and terminates the manufacture of the bag, which has merely to be severed from off the end of the strip along the perforated line, 20 (fig. 3). The folding flap, *y*, having previously resumed its horizontal position, so as to form a continuation of the table, Q, the strip moves along it to the knives, 21, which cut off the completed bag from the strip. One blade of the knives is stationary, and the other is moveable, being carried by vibratory arms, actuated by a wiper and lever arm. This wiper is fast on the same shaft that carries the wiper of the folding flap motion before referred to. The completed bag now passes between the delivering and pressing rollers, 22, and is delivered by them on to a delivery table, 23, these rollers being driven by an endless band and pulley. If found desirable, the tables, Q, may be provided with guide rails or ribs for directing the course of the strip through the machine, and an endless band may be used extending from the pressing roller to the pasting apparatus or further, and bearing upon the centre of the strip, so as to hold it flat down upon the tables, Q. If hinged folding flaps are used for folding over the lateral pasted flaps of the strip in lieu of the folding bars, they may be also made to act with a vacuum in a similar manner to the flap, *y*.

Fig. 4.



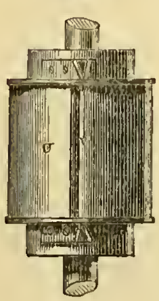
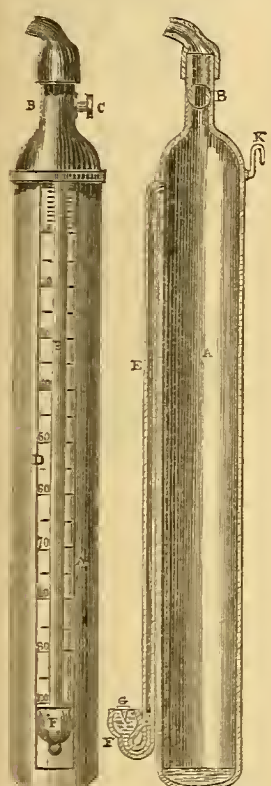


Fig. 5.

The arrangement of this machine admits of paper bags being made with great rapidity, and the bags so made are very regular and uniform in appearance, and in every respect equal, if not superior, to the hand made article.

PHOTOMETER, OR APPARATUS FOR MEASURING THE INTENSITY OF LIGHT.

M. Nobel, whose ingenious pyrometer we have had occasion to notice, has also devoted some considerable attention to the construction of apparatus for measuring the intensity of light. The apparatus invented by him for this purpose, is represented by the cuts annexed, which are respectively an elevation and vertical section thereof. This apparatus is provided with a scale upon which the intensities of the light are indicated. The principle of the apparatus is based on the property possessed by chlorine and hydrogen, of igniting under the influence of the faintest light. In the presence of water, which absorbs the hydrochloric acid gas so formed, the pressure of this gas decreases more or less rapidly, according to the intensity of the light, and the duration of the experiment. There is therefore in the gas receiver, a gradual and progressive diminution of pressure, which is made to indicate itself on a graduated tube in connection with this vessel; hence it is easy to construct a scale capable of showing the various intensities of different lights. A, is a glass tube for containing the gas, fitted at its upper end with a neck, B, and stop-cock, C. This tube, A, should be in communication by means of a vulcanised India-rubber tube with a gas holder, containing chlorine and hydrogen gas in equal proportions. It is upon this tube, A, that the light operates. It is fitted on one side with a capillary tube, E, terminating at the lower end in an open cup, F. Behind the tube, E, and upon the tube, A, is a graduated scale, D, and this tube is further provided with a hook, H, for the facility of suspending it in any situation in the light, the inteusity of which is to be measured. In using the apparatus, the tube, A, is first placed iu communication with the gas holder containing the chlorine and hydrogen gas by opening the cock, C. When there is no longer any atmospheric air in the tube, A, the cock, C, is elosed, aud the cup, F, is filled with water. The apparatus is now ready for action. In proportion as the light creates its action the two gases combine and form hydrochloric acid gas, which is absorbed by the water covering the bottom of the tube, A. It will thus be seen that the apparatus is nothing more than a sensitive manometer, which indicates by the progressive decrease of the pressure, the unities of light in relation to the duration and intensity of the luminous rays. Thus, a light of double intensity will only require half the time to allow the water in the cup, F, to be elevated by atmospheric pressure any given height up the tube, E. When the water has risen to the 100th degree in the tube, E, the cock, C, is opened, and the tube, A, again filled with gas, when the operatiou is repeated. G, is a float in the cup, F, for the purpose of closing the orifice of the tube, E, when the water reaches the 100th degree on the scale. The employment of water for absorbing the hydrochloric acid gas which it is found, is attended with one great incouvenience, namely, the condensation of the acid vapours on the sides of the tube, which interfere with its transparency. This condensation being continuous, will not interfere, however, with the accuracy of the experiment. Nevertheless, this liquid may be replaced by a pulverescent body in the bottom of the tube, A; such, for example, as lime, or any other good absorbent of hydrochloric acid gas. In delicate experiments, allowance should be made for the temperature, which would iufluence, undoubtedly, to a certain extent, with the pressure of the air upon the tube, A. In practice, however, it has been found that the duration of the experiment is too short to admit of any sensible variation being produeed by the influence of the temperature. Iu this apparatus, therefore, it is the amount of pressure of the air upon a column of water in the tube, E, which gives the desired result, and which cannot be obtained without the loss or diminution of pressure of the gas in the body of the instrument. This mode of measuring light, is, however, defective, as it applies only to white, violet, or blue light, and not to other colours, until chemistry shall have produced another substance, the sensitiveness of which accords with that of the eye, which itself, even as regards light, is not an instrument of precision, as there are many rays of light which affect but slightly the retina, and still act upon chemicals. It is not too mnch to hope that this apparatus may be found of service in the science of photography, where it is of great importance to know the equivalents of the ehemical effects produced by light. Numerous uses may be found by snitably modifying its construction, so as to render it easy of application and aecurate in its indications.



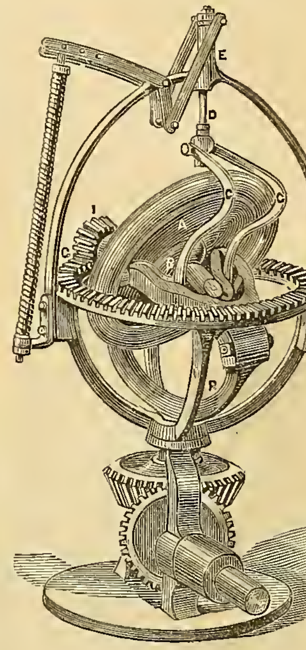
ON THE EMPLOYMENT OF A SOLUTION OF GLYCERINE IN GAS METERS AS A SUBSTITUTE FOR WATER.

Among the many nseful applications of glycerine few have surpassed, in practical utility, the substitution of glycerine for water in gas meters. The inconvenienees attendant on the use of water in gas meters are, as is well known, very great. Its evaporation during summer, and its congealation during winter, rendered it most desirable to substitute a fluid on which extremes of temperature should have no such influence. M. Barresvill has discovered, and has adopted as a substitute, a solution of glycerine, which he finds is not affected either by extreme heat of summer or by the greatest amount of cold to which gas meters may, under ordinary circumstances, be subjected to during the winter months. The results obtained from a series of experiments, prove that it is only necessary to employ a solution of glycerine, of such a degree of concentration that it shall contain from 40 to 45 per cent. of anhydrous glycerine, which solution will have a density of from 1·105 to 1·117, in order that those inconveniences which are attendant on the use of water may be entirely surmounted.

A gas meter in which a solution of glycerine having a density of 16°, Baumé, was employed, has been for some time in use, and although the temperature during last winter fell to 26° below zero, centigrade, the consumption of gas was most accurately registered.

GYROSCOPE STEAM ENGINE GOVERNOR.

The accompanying illustrative engraving, represents a new arrangement of a governor for regulating the action of marine engines. This governor is constructed upon the principle of the Gyroscope, and is the invention of a Mr. Alban Anderson, of Lancaster, Ohio, in the United States.



In the accompanying cut, A, is a heavy metallic wheel or disc, which is caused to rotate rapidly on its axle, B. The axle of the wheel, A, is made in two parts, one on each side of the wheel. The pinion, I, is fastened to one end of one of these pieces of the axle, and the opposite end is connected with the centre of the wheel by a universal joint in such manner that the rotations of the pinion, I, will cause the wheel to rotate, and will still permit a variation in the angle of its incliuation. The other piece, B, of the axle is connected at the centre, by a hinged joint, with the frame, H, so that the variations in the inclination of the wheel, A, will cause the outer end of the piece, B, of the axle to rise and fall. The frame, H, being connected with the machinery through the intervention of the bevelled gear, as shown, is caused to revolve upon its axis, by which meaus the pinion, I, is carried around upon the geared circle, G, imparting, as it rolls along, a rapid rotary motiou to the disc, A, at the same time constantly changing the plane of its revolution. As the momentum of its several parts tends to hold the wheel in the same plane of revolution, this forcible change in the plane of the revolution causes an effort on the part of the wheel to rise to a vertical position; a vertical plane being less remotely removed from the primary plaue of the disc's rotation than the inclined plane into which the wheel would be carried by the onward rolling of the pinion, I. This effort of the wheel to assume a vertical position tends to carry up the outer end of the portion, B, of the axle, and with it the rods, C and D. As this effort of the wheel is in proportion to the rapidity of its revolutions, if the rod, D, is counected with a throttle valve in the steam pipe, the speed of the engine is necessarily regulated The use of the spiral spring, J, is to counteract and balance the action of the disc, A. This invention is the first, perhaps, of a long series in which the same principle will be made available.

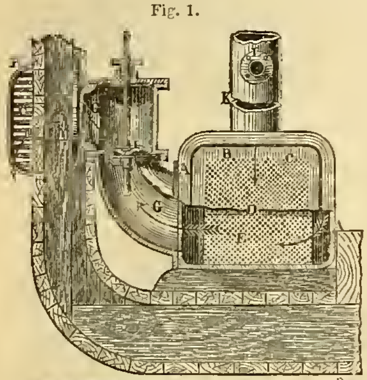
RECENT PATENTS.

REFRIGERATING APPARATUS.

John Ennson, *Wolverhampton.—Patent dated January* 13, 1860.

This invention relates to a peculiar construction and arrangement of apparatus for cooling or refrigerating liquids generally, but more particularly applicable to the cooling of the condensing water of marine steam engines. This apparatus, which is designated an "hydraulic decalorator," consists of an outer shell or casing of boiler plate, or other suitable material, forming a vessel or chamber of any convenient form, within which are disposed horizontally a number of small tubes supported by tube plates at suitable intervals. The tubes are disposed in rows in the form of a quincunx; that is to say, each tube of one row is opposite to the space between the tubes in the rows above and below it—the object being to afford greater facility for the free circulation of cold water round the tubes. The intermediate tube plates do not extend completely across the vessel or chamber, and are fitted alternately to opposite sides thereof, or to the top and bottom alternately, so that the cold water may flow in a zigzag or serpentine course along the outside of the tubes, as it passes from one end of the vessel or chamber to the other—an inlet and outlet pipe being severally fitted to the opposite ends of such vessel or chamber. A closed box or chamber is formed on each end of the before-mentioned vessel or chamber, into which boxes the ends of the tubes open; and these boxes are each fitted with a branch pipe leading—the one to the source of the heated liquid to be cooled (as, for example, the hot well in steam engines), and the other to the receptacle for the liquid after it has been cooled by passing through the series of refrigerating tubes contained in the vessel or chamber. When applied to a marine engine, the boilers may be kept constantly supplied with fresh water, and the condensed steam and water from the hot well may be returned to the boilers to be again generated into steam The cooling effect is derived by any convenient forcing apparatus, or by the motion of the ship itself when applied thereto, a current of cold or sea water passes through the cooling vessel and round the refrigerating tubes—the water passing off into the sea again from one end of the apparatus as fast as it enters by the other, so that a constant stream of cold water is obtained. The hot well is connected by a pipe with the box and tubes at one end of the vessel or chamber; whilst the other end of such vessel or chamber communicates by means of the ordinary injection pipe with the condenser. As the water from the hot well passes along the interior of the series of refrigerating tubes it becomes perfectly cooled, and is in that state injected in the form of spray into the condenser, whence it is removed with the water of condensation by means of the air-pump, and again returned to the hot well to be repassed through the "decalorator." Fig. 1 represents an end view of the patentee's "hydraulic decalorator" as applied to the cooling of the condensing water of marine steam engines. In this view, one of the end boxes or tube chambers is represented with its end cover removed to show the ends of the tubes in their tube plate. Fig. 2 is a plan corresponding to fig. 1 of the same part, broken away in the centre, and showing the connections with the side of the ship, and also the connections with the hot well and condenser respectively. In the lower part of this figure the covers are removed to show the tube chambers or end boxes in horizontal section. Fig. 3 is a detail face-view of a portion of one of the tube plates, showing the outside and inside diameters of the refrigerating tubes. Fig. 4 is a sectional plan of a portion of one of the intermediate or diaphragm plates, with a few of the tubes therein; and a similar view of a portion of one of the tube plates. A, is the outer shell or casing of the "decalorator;" it is composed of boiler plate and of a rectangular section, with rounded corners. At each end of this vessel or chamber there is formed a closed box or chamber, B and B¹, one side of each of which forms a tube plate, C, and into these plates are fitted the group of small tubes, D, which are caulked perfectly water-tight therein; the tube plates being composed of lead or other material, and having their holes cast therein with projecting nipples, as shown at *a* (fig. 4), for the convenience of caulking the tubes tightly therein. This group of tubes is supported intermediately between the tube plates by a series of diaphragm plates, E, which do not extend entirely across the main vessel or chamber, A, of the "decalorator," but project to within a short distance of each side, or of the top and bottom alternately, according as they are fitted alternately to the opposite sides as shown, or to the top and bottom alternately of the "decalorator," by which arrangement the current of cold or sea water which flows across and along the outsides of the tubes, as hereinbefore described, is made to take a serpentine or zigzag course, as shown by the arrows in fig. 2. For the facility of fixing these diaphragm plates, projecting flanges are fitted or formed on the inner sides of the vessel or chamber. F, are a series of openings made in the upper side of the vessel or chamber, A, and provided with tight-fitting covers bolted thereon; these covers are, however, removed in the drawings in order to show the diaphragm plates and tubes more clearly—the object of the openings being to facilitate the introduction of the diaphragm plates, and the inspection and cleansing of the vessel or chamber when requisite. This apparatus is intended to be placed near the inner side of the ship, and is provided at each extremity with a lateral branch pipe, G, passing through the ship's side and opening into the sea, as shown at figs. 1 and 2. On the outside of the ship, and over each opening, is fitted a hood, H, the respective mouths of which are placed in opposite directions, for the purpose of allowing the sea water to rush in at one branch by the forward motion of the ship; and after passing and re-passing across and along the outsides of the several refrigerating tubes, D, is delivered again, or pass off through the delivery branch, G₁. A grating, *c*, may be placed over the mouth of each hood, for the purpose of preventing the entrance of sea-weed or other substances into the apparatus. I, is a stop valve fitted inside the delivery, and also inside the inlet branch, for the facility of shutting-off the sea water when requisite. K, is a large pipe connecting the hot well with the tube chamber, B; and to this pipe is connected the feed-pipe, L, of the boiler, which pipe should be placed about the height of the lower side of the discharge pipe of the condensed water, or not more than two feet below it. M (fig. 2), is the pipe leading from the tube chamber, B¹, to the condenser. Care should be taken in constructing the "decalorator" that both ends be easy of access, so that by removing the end covers any defective tubes can be replaced by perfect ones. The patentee, also, so proportions the dimensions that the stream of fresh water passing through the insides of the refrigerating tubes shall flow rapidly and without obstruction—the length of the tubes being such as to effectually cool the water by the time it has passed once through them—such current of fresh water through the tubes being in the contrary direction to the current of sea or cold water outside the tubes, and in this manner the object of the invention is very effectually obtained.

Fig. 1.



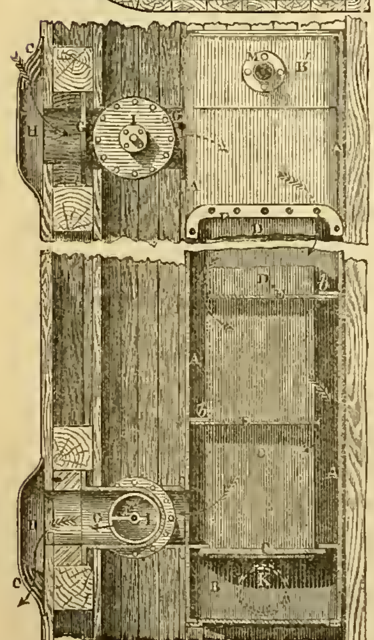
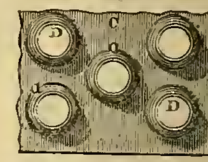


Fig. 2.

Fig. 3.



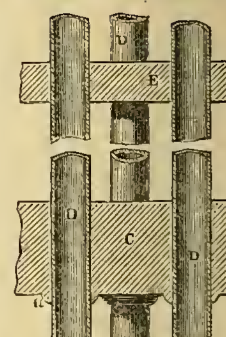


Fig. 4.

MEASURING AND REGISTERING THE FLOW OF LIQUIDS.

James Sim, *Aberdeen.—Patent dated March* 14, 1860.

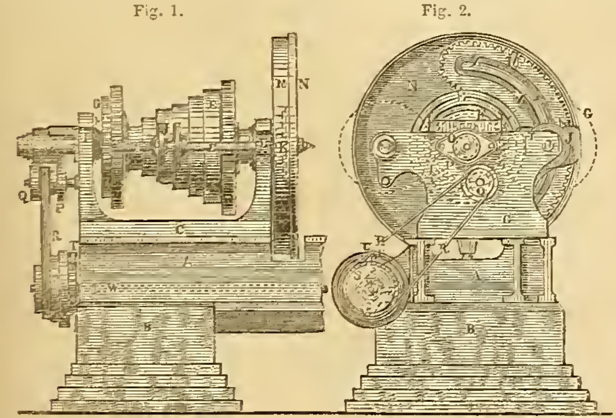
This invention refers more particularly to a system or mode of measuring and registering the quantity of liquid withdrawn from the stock cask, vat, or reservoir. Under one arrangement for effecting this object, to the tap or valvular apparatus fixed in the lower part of the vessel is attached a pipe or flexible tube, which communicates with a tubular plug or spigot, made to fit air-tight to the faucet or bunghole of the cask or vessel to be filled. The plug or spigot is made with duplex tubular passages through it, both of which are in communication with pipes or flexible tubes. One of these tubes serves to convey the liquor from the stock cask into the vessel to be filled, and hence its free extremity is attached to the nose of the tap in the stock cask. The free end of the other tube is connected to the inlet pipe of the meter, by means of which the quantity of liquid passed or allowed to run into the cask or receiving vessel is accurately measured and registered. The meter which the patentee prefers to use for this purpose is a modification of the ordinary gas or air meter, and is so arranged as to measure the quantity of air passed through it, and register the same in liquid measure, or gallons and aliquot parts thereof. A meter specially designed by Mr. Sim for this particular purpose is described and delineated in our *Journal* for July last. With the stock cask arranged as described, and communicating by means of the pipe or flexible tube with the cask or air-tight receiving vessel, it follows that upon any liquid being allowed to flow into the receiving vessel a corresponding quantity of air contained in the vessel will be displaced. The air so displaced by the admission of the liquid to the receiving vessel flows away by the secondary or air tube to the meter, its admission to which causes the measuring drum to be put in motion, which registers the quantity of air in gallons, or parts of the same. There is in the meter referred to a rim wheel on which is engraved the aliquot parts of a gallon, and there are three index plates with indexes or pointers similar to those of an ordinary gas meter, but arranged for indicating gallons, tens of gallons, and hundreds of gallons. Thus, one revolution of the rim wheel causes the first wheel of the train to move its pointer, and indicate one on the corresponding dial. In this way, as the liquid flows into the vessel, the air displaced from it causes the measuring drum to keep up its rotatory motion, and duly register on the index plate the quantity withdrawn from the stock cask, vat, or reservoir. With this arrangement, the owner of the stock liquid has at all times the means of checking the quantity of liquid withdrawn from time to time from the stock vessel, and of knowing the quantity contained therein. The meter and its connecting tubes may also be arranged in permanent connection with the stock vessel, the tubular plug or spigot only being left free to be inserted in the vessel to be filled. And in this way, a constant and accurate account of the quantities of liquid abstracted from the stock vessel may be kept. The meter may also be made available for registering the quantity of liquid added to the contents of the stock cask, provided it is a closed vessel. To register in this way, a note is taken of the contents of the stock vessel, as indicated by the meter, prior to making the addition. The tube attached to the inlet pipe of the meter is disconnected from the tubular plug or spigot, and connected with the upper part of the stock cask by means of a union joint, so as to put the space above the liquid in communication with the meter. The liquid to be added to the stock is by preference passed into the cask by means of a tube made air-tight with the top of the cask, and dipping into the liquid to prevent the escape of the air contained within the vessel, except through the tube leading to the registering apparatus. The liquid may be run into the stock vessel in any convenient manner, and without requiring attention; for as it flows into the vessel the quantity is duly registered on the index plate of the meter, and it is only necessary to turn off the supply when the required quantity has been run in. A note is then taken of the contents of the stock vessel to serve as a check upon the quantities subsequently run off from the same. In this way, the meter may be arranged in a locked case, and serve to register the additions to the stock, as well as the quantities taken therefrom.

TURNING LATHES.

James Eastwood, *Derby*,—*Patent dated November* 28, 1859.

The patentee's improvements relate to lathes for turning parts or segments of arches, and consist in having, on the back of the face plate of an ordinary lathe, an internal toothed segment, into which gears a pinion carried by a shaft so as to work or turn the face plate a certain distance, and then to turn it back again, the shaft of the pinion being carried by a sliding bearing, and one end is supported in a groove in the segment on the face plate, whilst the other end is connected to the

Fig. 1. Fig. 2.



driving shaft by a universal joint. Fig. 1 of the accompanying illustrative engravings, is an elevation of an ordinary lathe fitted with the patentee's improvements; fig. 2 is a corresponding end view. A, is the bed plate of the lathe resting on the stone blocks, B, and provided with the ordinary fast and loose heads, C and D. Motion is imparted from any prime mover, by means of a belt, to the cone pulley, E, on which is keyed the wheel, F, this wheel gears into the wheel, G, keyed on the shaft, H, which works at one end in the fixed bearing, I, and is provided with a universal joint, J, midway in its length, to allow of the lateral motion of the pinion, K, in its sliding bearing, L, when passing round the end of the toothed segment, M, formed on the back of the face plate, N. The feed motion for the cutters is driven by the wheel, O, keyed on the end of the lathe spindle and gearing into a wheel, P, fixed to the cone pulley, Q, which drives by the aid of the strap, R, a pulley, S, moving loosely and having a pall, T, attached to its side by the pin, U, and taking into a ratchet wheel, V, keyed fast on the transverse shaft, W. A continual advancing motion is thus imparted to the cutter. X, is the back of the face plate, with the segment, M, attached, showing the pinion, K, passing round the end of the segment, being guided in its course by the projecting end of the shaft, H, moving in the groove, X. The cut being made whilst the pinion is traversing the outer and longer portion of the segment, it is obvious that a "quick return motion" will be given to the face plate, in consequence of the pinion having a less distance to traverse along the inner and shorter portion of the segment. When it is desired to work the lathe for ordinary purposes, the shaft, H, is moved sufficiently far endwise to keep the wheels, F and G, and the pinion, K, out of gear, or a universal joint, consisting of a ball having a pin through its centre, on the projecting ends of which the joint works; at right angles to this pin are two screws for connecting the joint, thus forming a universal joint which may be used in place of the one shown in the engravings.

METALLIC ALLOY.

J. H. Johnson, *London and Glasgow*, (C. Novel, *Paris.*)—*Patent dated April* 5, 1860.

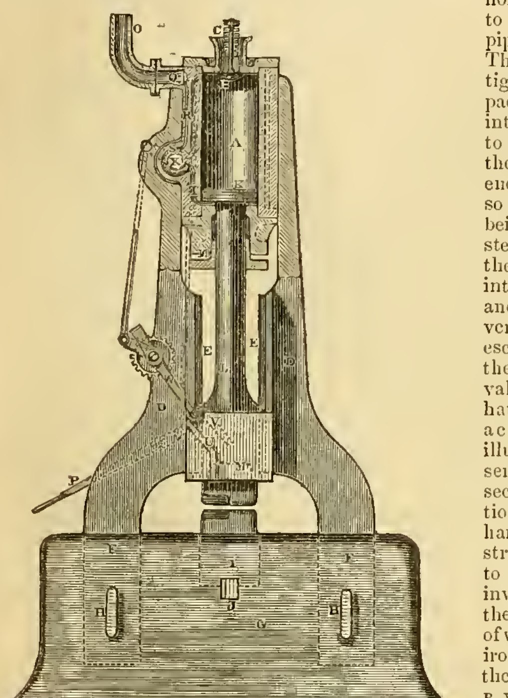
These improvements comprehend the production of a metallic alloy which has the properties of cast steel, so as to render it capable of being substituted for ordinary steel; and as its cost is much reduced, it may be applied in all cases where expensive forging-work is now employed. The bases of this alloy are wrought iron and cast-iron of any quality, melted together in suitable proportions to give to the alloy so obtained the desired amount of carbon according to the degree of hardness required in the alloy. In relation to steel, it is well known that wrought iron contains less carbon, and pig iron an excess of carbon; now, by alloying with the wrought iron (which is in a sub-carbonized state,) just so much pig metal (which is in a super-carbonized state) as will give to the alloy the percentage of carbon required to make cast steel of any desired degree of hardness, the free carbon impurities being extracted as hereinafter described, a product will be obtained having all the properties of cast steel, with the other advantages we have mentioned. The greater the proportion of pig metal employed, the harder will be the alloy, and *vice versa*. The patentee has found in practice that 15 per cent. of pig metal will produce a very soft alloy; 25 per cent. a good medium quality, and so on, care being taken to vary these proportions in accordance with the more or less carbonized state of the wrought iron, as it is obvious that a highly carbonized iron will require less pig metal than a less carbonized variety to produce an alloy of a given degree of hardness. In preparing the alloy according to this invention, the patentee takes any iron without regard to its state of purity, and after ascertaining the extent of its impurities, he introduces into the crucible or melting pot, a combination of certain chemicals subsequently referred to, which, by their affinity for the impurities, will extract them and leave the metal pure. The production of the alloy and the requisite purification of the iron are effected at one operation in an ordinary furnace, and melting pots and the use of cementing furnaces are entirely dispensed with. Although the foulest iron may be employed, yet as this necessitates the use of a large charge of chemicals which would tend to destroy the melting pots, it is preferred to use our ordinarily clean English, Scotch, or Welsh iron, such as can be bought at about £8 per ton, and grey pig metal of the like description at about £3 per ton. The patentee, however, recommends a highly carbonized iron, as it melts more easily; but when this kind cannot be obtained, the fusing may be assisted by the addition of a small quantity of charcoal. The wrought iron to be melted is now cut up into suitable pieces, and the pig metal broken up so as to be easily introduced into the crucible or melting pot. The proportions of each being varied according to the carbon they contain and the hardness of the alloy required, as before described. It will be found advantageous in practice to add the pig metal (having previously heated it) to the wrought iron after the first furnace charge has burnt down, as the pig metal fuses more rapidly than the wrought iron. When the alloy has assumed the state of dough, or become a pasty mass, the requisite purifying chemicals and fluxes may be added. The combination of chemicals which it is proposed to use, consists of oxide of manganese, sesquioxide of iron, or mineral oxide, well purified from sulphur; sal ammoniac and nitrate of potash, in suitable proportions, varying with the more or less impure state of the iron. For such iron as mentioned as being most suitable, the following proportions will be found to answer for a crucible containing 40 lbs. of alloy, viz.:—½ lb. of oxide of manganese, ½ lb. of oxide of iron, and three ounces each of sal ammoniæ and nitrate of potash.

In treating very impure iron, these quantities may be doubled; but for the finer sorts of iron, 4 oz. of each of the oxides, and $2\frac{1}{2}$ oz. of each of the salts will be found sufficient. According to the nature of the impurities, so will the above proportions be varied; as, for example—as the iron contains more or less of earthy matters, so will the proportion of oxide of iron be increased or diminished, the same remark applying equally to the salts in relation to the quantity of phosphorous, sulphur, and other similar impurities contained in the iron. If desired, a small quantity of the metallic oxides, or other well-known chemicals which are believed to produce beneficial results, may be added to the alloy, but it has been found in practice that their presence is not necessary.

STEAM HAMMERS.

James Eastwood, *Derby.—Patent dated November* 28, 1859.

These improvements consist in constructing the standards of steam tilts or hammers of wrought iron, to form guides for the hammer trip, in securing the bottoms of the standards into the anvil block and the cylinder between them at the top. This invention further relates to a valve of a cylindrical form, having flanges at each end, so as to leave a chamber for steam between the valve and the outside casing The valve has an opening in the circumference, with sufficient material on each side of the opening to allow for "lap," as in ordinary slide valves; it is hollow and open to the exhaust pipe at one end. The valve is kept tight by metallic packing rings let into grooves cut to receive them in the flanges on the end of the valve, so that on its being turned, the steam passes from the steam chest into the cylinder, and on being reversed, the steam escapes through the centre of the valve to the exhaust pipe. The accompanying illustration represents a partially sectional elevation of a steam hammer, constructed according to the patentee's invention. A, is the cylinder made of wrought or cast-iron, fitted with the vacuum valves B, which is held in its proper position by the spiral spring, C, in the usual manner. The cylinder is firmly bolted to the standard, D, forged to the required shape, and having the guide pieces, E, formed on their insides. These standards are turned at their ends, F, to fit holes previously bored in the anvil block, G, and are secured therein by the cotters, H; or the ends may be flattened out to form feet, and be keyed and dovetailed into the anvil block. The anvil itself has a shank, I, cast on it, and is fitted into a recess cast in the bed plate or block, as shown by the dotted lines; a hole being cast transversely in the block, at J, to admit the end of a bar for forcing the anvil out of its socket when it is to be changed. When the piston, K, rod, L, and tup, M, are formed of one forging, as shown, the bottom cylinder cover, N, and glands, are put together in halves vertically, and the joint secured by bolts. On steam being admitted from the boiler into the pipe, O, the hand lever, P, which communicates with the stop valve, Q, by means of a rod and lever, is moved so as to admit the steam down the port, R, into the steam chamber, S, surrounding the valve, thence through the steam ports, T, into the cylinder. The piston, K, piston rod, L, and tup, M, being thus raised, the tripper slides, U and V, are brought into contact with the rollers, on the end of the lever, W, which may be adjusted to give a blow of the required force in the manner described in the specification of the patentee's former patent, No. 2659, dated October 17, 1857; or, by fixing both the tripper slides on one side of the tup, and in that case using one lever only. The valve rod works steam-tight, through a gland, actuating the cylindrical valve, X. B, is the steam chamber round the outside of the valve, the interior, D, forming the exhaust passage communicating with the exhaust pipe, the two chambers being kept steam-tight and apart, by packing rings. In another modification the cylinder, A, is secured to the standards, D, by longitudinal flanges and bolts, and is recessed to lighten the cylinder, and if necessary, to admit of projections being left on the standard for taking the strain off the bolts.



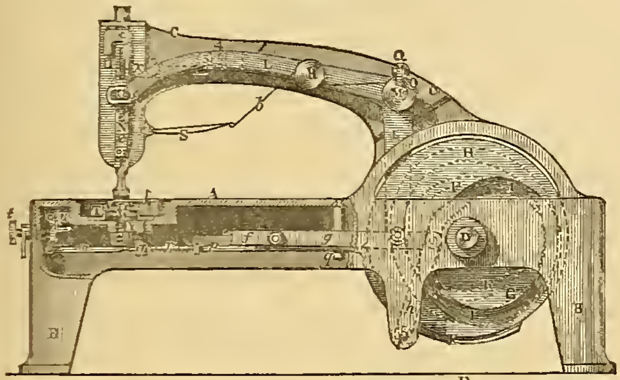
SEWING MACHINES.

Seth Ward, *Battersea.—Patent dated February* 24, 1860.

The object of the patentee's improvements is to obtain greater nicety of adjustment of the tension of the two threads used in forming the ordinary lock or shuttle stitch, as well as increased certainty of feed. According to this invention, the lower thread is carried by a spool contained within an eccentric thread box, which has a reciprocating circular motion imparted to it by means of a rack and pinion wheel, the latter gearing into corresponding teeth, made in the inner edge of the eccentric thread box. An inclined or tapered nose is formed on the thread box for the purpose of catching the loop of the needle thread, and opening it for the passage therethrough of the lower thread The thread box works round a fixed boss, in which is fitted a small tension plate, which is made to rise at the proper time and hold the lower thread against the under surface of the covering plate, which may be inlaid with a piece of leather, or other soft material at that part. The rising motion of this tension plate is adjusted with great nicety, by means of an adjusting screw and incline plane, so that the tension or hold on the thread may be regulated to any desired extent with great accuracy. A small stud or pin is passed vertically through the fixed centre piece or boss, and enters the covering plate. This pin serves the two-fold purpose of always keeping the lower thread on the proper side of the needle, and of holding the covering plate in its place. The proper tension of the needle thread is obtained by passing such thread on its way from the bobbin through the head of a screw, and one or more times round the groove of the thread of such screw. The tension is regulated by simply turning the screw, more or less, which has the effect of increasing or diminishing the hold of the thread thereon.

Fig. 1 of the subjoined engravings represents a side elevation and partial section of the patentee's sewing machine. Fig. 2 is a plan of the underside of the table, showing the mechanism at that part; A, is the table of the machine, provided with suitable supports, B, and having an overhanging bracket, C, cast thereon. The main driving shaft, D, passes transversely through the table, and is fitted with a fly wheel, E, and band pulley, F, the latter being used when the machine is to be driven by steam or other power; when driven by hand, a handle may be fitted on to the fly wheel. G, is a metal disc keyed on to the main shaft, D, and having cam grooves, H and I, made in each lateral face, whilst a projecting rim, K, is formed on a portion of its periphery. This disc, with its cam grooves and projecting rim, imparts the whole of the necessary movements to the sewing mechanism of the machine. In the groove, H, works an anti-friction roller, carried by the vertical arm of the bell-crank lever, L. This lever vibrates on a fixed centre, M, in the bracket, C, and its horizontal arm imparts the up and down motion to the needle slide, N, which works in suitable guides in the end of the bracket, and is connected with the lever, L, by means of a stud, which takes into a slot formed in the end of that lever. The needle thread is contained on the bobbin, O, which is carried by a stud coinciding with the working centre of the needle lever, L. Q, is a weighted friction lever, hinged to a boss on the stud carrying the lever, L, and bearing upon the surface of the bobbin, so as to prevent it from overrunning when the thread is drawn off in the operation of sewing. From this bobbin the thread passes through the head of the tension pin, R, carried by the lever, L, and is wound one or more times in a spiral groove in the tension pin, according to the amount of tension required. This tension is easily regulated by twisting the pin by means of its milled head, which will have the effect of increasing or diminishing the number of coils round the pin, and so adjusting the tension of the thread. S, is a slight spring, through an eye in the free end of which the thread passes, before being passed through the guide eye. *c*, in the end of the needle lever, and through the eye of the needle, which is of the ordinary kind used in sewing machines. The object of the spring, S, is to take up the slack during the descent of the needle. The under, or shuttle thread, is carried by a small spool, fitted inside the eccentric thread box, T. This thread passes out through a hole made in the lid or cover of the thread box, its desired tension being obtained by means of suitable mechanism. A circular aperture is made eccentrically in the thread box, and round its lower edge are formed a series of teeth, *d*. This aperture fits accurately a stationary boss, V, fig. 1, fixed into a recess or chamber, made in the table, A, and serving as a centre, round which the thread box reciprocates. A circular reciprocating motion is imparted to the thread box by the toothed wheel or driver, W, which gears into the internal teeth of the thread box. The driver, W, is carried by a vertical spindle, X, rotating in the piece, Y, screwed on to the underside of the table, and this spindle is provided at its lower end with a pinion, Z, to which motion is given alternately in opposite directions, by means of the horizontal reciprocating rack, *e*. *f*, are guides for maintaining the rack in position, and *g*, is a link which connects the end of the rack to the oscillating supporting lever arm, *h*, working on a fixed centre at *i*, the head of this arm at the point of junction with the link, *g*, is provided with an anti friction roller, which works in the cam groove, I. The proper tension of the shuttle or under-thread is obtained by means of a button or tension plate, *k*, the stem of which is passed through the boss, Y, and driver spindle, and projects a short distance below the pinion, Z. At each stitch the thread is extended across the surface of the tension plate, which latter is made to rise at the proper time and grip the thread with more or less pressure, by forcing it against a pad or a polished surface of any suitable material

Fig. 1.



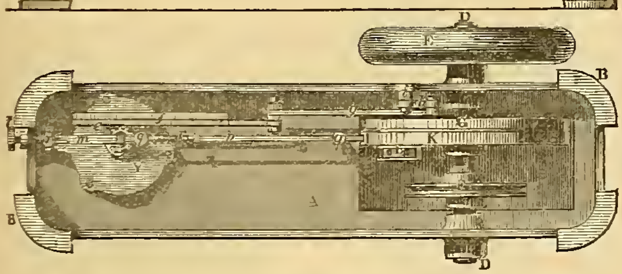
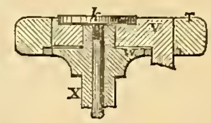


Fig. 2.

inlaid in the under surface of the covering plate, *l*, thereby imparting the desired tension to the shuttle thread at the precise time required, namely, at the ascent of the needle and tightening of the stitch. The rising of the tension plate is effected in the following manner:—The lower end of its stem rests upon, and is supported by, the bar, *m*, which is bevelled or inclined at one end, and is jointed by a pin at *n*, to the link, *o*, suspended from the underside of the table, A. The bevelled end of the bar, *m*, rests upon the reversed bevelled end of a sliding bar, *p*, which slides longitudinally through the fixed supports, *q*, and is held in contact with the projecting rim or cam surface, K, of the disc, G, by a helical spring, *r*. As this disc rotates, the cam surface, K, pushes forward the sliding bar, *p*, the bevelled end of which, by sliding under the bevelled end of the bar, *m*, elevates that end of the bar, and, consequently raises the tension plate, *k*, and holds the thread with more or less firmness against the underside of the covering plate, until the passage of the cam surface, K, releases the bar, *p*, and allows it to be slid back again to its original position by the action of the spring, *r*, when the tension plate descends by its own gravity and releases the thread. In order to regulate the lift of the tension plate and consequent grip on the thread, the adjusting screw, *t*, is turned more or less, which has the effect of slightly raising or lowering, as the case may be, the free end of the bar, *m*, and with it the tension plate; and as the bar, *p*, always travels the same distance, it follows, that at its next stroke the tension plate will rise higher or lower according to the direction in which the adjusting screw has been turned. A small spring, *u*, serves to hold the link, *o*, against the end of the adjusting screw. The feed motion is derived entirely from the needle actuating mechanism. It is represented in detail at fig. 3, and consists of two plates, *v*, having their under surfaces roughened or serrated, and being hinged or jointed to the lower end of the vertical feed bar, *w*, suspended from the knife edge end of the lever, *x*, hereinafter referred to. This bar has a horizontal or lateral vibratory motion imparted to it, as well as a vertical or up and down motion. The horizontal motion which serves to move the cloth along, is derived from a wedge piece, *y*, on the inner side of the needle slide, which, as the latter rises, presses against the end of the stitch regulating screw, *z*, and forces out the bar laterally, at the same time carrying the cloth along with it, the roughened feed plates being kept pressed down upon the surface of the cloth by the helical spring, 1, contained within the head of the overhanging bracket. The amount of this lateral traverse is of course capable of regulation, so as to produce longer or shorter stitches as desired, by causing the screw, *z*, to protrude a longer or shorter distance through the feed bar. On arriving at the end of its stroke, the bar is elevated slightly, so as to lift the feed plates from off the surface of the cloth, and in this elevated position it is returned back again laterally, so as to be in readiness for the next traverse, before effecting which, it is allowed to drop down, so as to bring the feed plates again in contact with the surface of the cloth. The rising of the feed bar is effected by means of the lever, *x*, shown in figs. 1 and 8, which works on a fixed centre pin, 2, in the bracket; c-3, is a tumbler, carried by the bracket, and bearing upon the end of the lever, *x*. A spiral spring being fitted on to its axis for the purpose of maintaining it in its proper position when not acted upon. On the needle lever, L, is fitted a wiper or taffet, 4, the head of which is so shaped as to catch and draw down the tumbler, 3, on descending, and with it the end of the feeding lever, *x*, thereby elevating the feed bar and roughened plates, during which time the descent of the needle slide brings the incline, 5, against the tail, 6, of the lever, 7, which is centred at 8, and bears at its opposite end against a pin, 9, projecting from the side of the feed bar, and consequently pushes that bar inwards, and returns the roughened feed plates back again towards the needle, so as to be in readiness for the next stroke. During the upward motion of the needle lever, L, the wiper or taffet passes the end of the tumbler freely without influencing the lever, *x*, which has already been released by the passage of the wiper, and allows of the descent again of the feed plates on to the cloth at the starting point of the feed. By this arrangement, the use of a separate pressing or stripper plate is obviated, as the feeding plates answer the twofold purposes of holding down the cloth and feeding the same, and are slotted to allow of the passage of the needle between them. A spring hook, 10, is fitted to the feeding bar, for the facility of keeping it elevated when out of action.

Fig. 3.



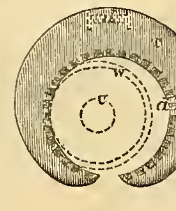
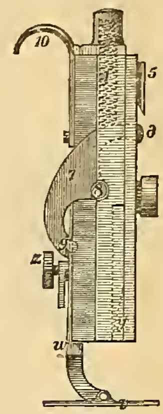


Fig. 4.

Fig. 5.

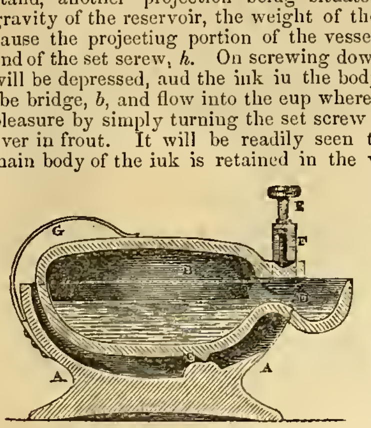


INKSTANDS.

J. H. Johnson, *London and Glasgow* (H. Evans *and* H. Howson, *Philadelphia, U.S.*)—*Patent dated January* 27, 1860.

These improvements relate to a peculiar arrangement and construction of inkstand, in which the main body of the ink is unexposed to dust and dirt, whilst a constant and uniform supply of ink is maintained in the dipping cup, the whole forming a cheap and simple inkstand. According to this invention a closed reservoir or receptacle is employed for the ink, which has a cup-shaped mouth or dipping cup formed on one side, and being so hung or pivoted on any suitable stand, and combined with one or more adjusting screws, that by operating the said screw or screws the reservoir will be more or less tilted on the stand, and cause the ink to flow either to or from the dipping cup or mouth, according to the direction in which the reservoir is tilted.

The subjoined illustration represents a vertical section of the improved inkstand. A, represents the stand, and, B, the ink reservoir. This reservoir may consist of a vessel of glass, metal, or other suitable material. It may be made, as represented in the drawing, of a circular form, flat or nearly so on the top, and convex on the under side, so as to be adapted to the cup-shaped stand, A. The latter has an opening in front to admit the neck of the dipping-cup, *a*, which projects from and forms part of the reservoir, B, the cup being open at the top and divided from the main body of the reservoir by the bridge, *b*. On the under side of the reservoir is an elongated sharp-edged projection, *e*, which rests on an elongated notch on a projection, *f*, on the inside of the cup stand, A. Over the neck of the vessel passes a bridge-piece, *d*, which is secured to the edge of the stand, A, and receives the set screw, *h*, the lower end of which bears on the neck of the vessel, B, near the opening of the projecting dipping cup. It will be observed that the cup of the stand, A, is somewhat larger than the body of the reservoir, B, which, however, fits so close to the upper edge of the stand as to prevent any excessive lateral play of the reservoir. The sharp-edged projection, *e*, is the only point where the reservoir rests on the stand, another projection being situated in front of the centre of gravity of the reservoir, the weight of the latter and its contents will cause the projecting portion of the vessel to bear upward against the end of the set screw, *h*. On screwing down the latter the dipping cup, *a*, will be depressed, and the ink in the body of the vessel will pass over the bridge, *b*, and flow into the cup where its depth may be increased at pleasure by simply turning the set screw so as to tilt the vessel further over in front. It will be readily seen that by this arrangement the main body of the ink is retained in the vessel free from the access of dust and dirt, and comparatively free from exposure to the air. In order to impart additional steadiness to the vessel, a spring, *x*, on the stand may be arranged to press on the top of the reservoir, which will be thereby more steadily confined to the stand. By arranging the fulcrum point, *e*, however, so that it may be nearer the screw, the overhanging portion of the vessel will present a leverage by which it is confined steadily between the fulcrum point and the point of the screw. The stand, in another modification, consists of a simple metal ring closed on the top, with the exception of an opening just large enough to admit the main body of the reservoir, and allow it to vibrate freely on the fixed point, which is nearer the screw, *h*, than in the previously described arrangement. The reservoir, B, also, is of a form differing somewhat from that shown in the figure; its shape on the underside in respect to that of the projecting cup being such, that when the ear or overhanging portion of the vessel is allowed to fall by raising the screw, the ink will flow back over the bridge, *b*, into the body of the vessel, leaving the cup nearly empty. When the screw is turned so as to raise the rear of the vessel the ink will flow back into the projecting cup, and will there retain the same level as the ink in the reservoir, so that the constant dipping of the pen into the cup does not diminish the depth of the ink in the latter to any greater extent than if it was dipped directly into the body of the reservoir. When the ink in the reservoir, and consequently in the cup, becomes diminished, a slight turn of the screw will tilt the reservoir and increase the depth of the ink in the dipping cup. The depression of the cup may be repeated at such intervals as circumstances require, until the whole of the ink in the reservoir is consumed, when the vessel may be readily refilled by pouring the ink into it through the neck of the cup. The vessel may be arranged with trunnions, which are made to fit into bearings on the opposite sides of the stand, A. A bridge-piece is secured to the upper edge of the stand, and through this bridge-piece pass two adjusting screws, the ends of which bear upon the vessel, one on each side of its centre of vibration. By tightening one screw and slackening the other the front of the reservoir with its cup, *a*, can be raised or depressed at pleasure, the two screws together serving to secure the reservoir steadily to the stand after adjustment.



It will be evident that both the stand and reservoir of this inkstand may be varied in form without altering the result, and that both admit of being highly ornamented and made of different materials.

COLOURS FOR DYEING OR PRINTING.

J. H. Johnson, *London and Glasgow*, (L. & E. Boilley, *Paris.*)—*Patent dated March* 24, 1860.

This invention relates to the production of a new colour from indigo, which colour, the inventors term "purple blue," and is applicable to the dyeing and printing of fabrics. Take a quantity of anhydrous of bisulphate of soda, from ten to twenty times the weight of the indigo to be treated. This soda should be subjected to heat until it fuses, and kept in a fused state at a temperature of about 200 to 300 degrees centigrade. In this state the pulverised and sifted indigo should be gradually added to it, the mixture being constantly stirred to prevent it from adhering to the bottom of the vessel. This operation may be effected in any convenient vessel of cast-iron, platinum, porcelain, or other suitable material; the mass swells out, disengages gas, and assumes a dark colour. The operation should be discontinued as soon as the mixture colours clear water a violet red, and this test should be from time to time employed in small quantities. By this time the mixture will have become of a pasty consistency. At this stage the whole mass is thrown into a large quantity of water, say seven or eight gallons of water for each pound weight of the mixture, the whole being well stirred together. To this is now added about two pounds weight of chloride of sodium or common salt, after which the whole is allowed to cool, and the product is thrown down in an impure state. This product is a purple blue of a peculiar kind, which only requires to be well washed in abundance of salt water to obtain it of the proper purity for use. In lieu of salt water, any alkaline water in which the blue is not soluble, may be employed, as, for example, water containing acetate of potash, chloride of potassium. It only remains to filter the liquid in order to collect the precipitate, and to dry the same after having removed the matters which are found on the surface, these matters which are of a blackish or greenish colour, are of another nature, and being of lighter weight they will not be deposited until the liquid has been allowed to stand some time. The product thus obtained is in the form of small crystals. The sulphate of soda which remains in solution in the wash water may be extracted, and ultimately transformed into bi-sulphate of soda by known methods, so as to enable it to be used again. The waste salts of soda produced in the preparation of nitric acid may be employed in conjunction with a suitable quantity of sulphuric acid to form sulphate of soda. The patentee claims the anhydrous bi-sulphate of soda by whatever process it may be obtained. In place of first fusing the bi-sulphate of soda and adding thereto the indigo, the two products, either in a pulverised or unpulverised state, may be mixed and heated in crucibles placed in a furnace and subjected to a high temperature. Bi-sulpate of potash may also be employed in lieu of bi-sulphate of soda. This purple blue may also be obtained by the aid of other acids; for instance, anhydrous phosphoric acid may be added to the sulphuric acid, and the indigo subjected to the mixture. If the operation is performed cold the indigo will not be properly acted before the end of a month, and the operation is concluded when a violet red is obtained on testing a portion of the material in water. It then only remains to wash the mass as before described. By applying heat, the operation is accelerated. Another mode of operating is to subject powdered indigo to the vapour of three times its weight of anhydrous sulphuric acid. The vapour is conducted to it by any suitable mode and condensed on the indigo, which may have been subjected to the action of Saxe's sulphuric acid. The indigo is left exposed to the vapour until a portion of the substance placed in water will give a violet or red—the operation is then stopped, and the product is washed as hereinbefore described. Another process consists in subjecting the indigo to the action of chloride of potassium in combination with anhydrous sulphuric acid. In all their processes it is necessary to filter the product once dissolved before adding thereto the marine salt, in order to separate the insoluble matters and the indigo which may not have been acted on. The purple blue may be likewise obtained by the hydrated bi-sulphate, in place of the anhydrous. The impure indigo of commerce may be employed in place of pure indigo in these processes, but the operation, in that case, will require a longer time and a higher temperature.

MANUFACTURE OF FUEL.

J. H. Johnson, *London and Glasgow*, (E. D. Williams & J. Reed, *Philadelphia, U.S.*)—*Patent dated March* 3, 1860.

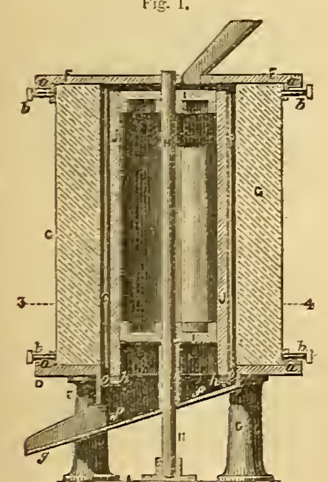
This invention consists in compounding and preparing a solidified fuel from coal dust, peat, and other like substances, by mixing the same with a glutinous paste or size, subjecting the composition to pressure in moulds, and subsequently drying the pressed blocks so that they may be hard and portable—may serve as an efficient fuel, and retain their solidity until gradually consumed by the fire. In carrying out this invention, a paste or size of rye or wheat flour is prepared by mixing it with water and boiling the compound in the usual manner, the paste being sufficiently fluid to mix readily and intimately with coal dust or coal screenings. Sour flour, unfit for culinary purposes, may be used for making this paste, as also may any suitable vegetable or animal glutinous substance. A paste made of twenty pounds of wheat flour will be found amply sufficient for solidifying one ton of anthracite coal dust. The paste having been intimately mixed with coal dust, a suitable portion of the compound is placed in a mould which may be similar to that of an ordinary brick making machine, and submitted to powerful pressure. If a quantity sufficient to form a block of the size of a building brick has to be compressed, the pressure necessary for producing the required solidity will be from seventy to one hundred tons. By this pressure, the small amount of glutinous substance, which without the pressure would not serve to unite the particles of mineral, becomes so closely and thoroughly impregnated with the latter, that the whole becomes a solid mass, which, when properly dried, is sufficiently hard to admit of its being carried about without breaking, and yet brittle enough to be readily shattered by a blow from a hammer or other suitable instrument. The blocks should be dried immediately after being pressed, the drying being accomplished rapidly in order to prevent any decomposition of the glutinous paste, the temperature required being equal to, or above that of, summer heat. During the compression of the composition in the moulds, the mass may be perforated so as to render it more homogeneous, and so obviate the tendency of the compound to crack during the process of drying. For ordinary purposes, the blocks are ready for use, as a fuel, immediately after drying; but when they have to be used for long voyages, or have to be stored in localities which subject them to long continued exposure to moisture they should be coated with asphaltum, or other water-proof combustible substances or compounds, in order to prevent them from absorbing moisture. In applying the invention to the solidifying of peat, a greater proportion of glutinous paste is required. The dried paste is granulated, mixed with the paste, subjected to pressure in moulds, and subsequently dried, precisely in the same manner as that described in reference to the coal dust, or the peat may, in some instances, be mixed with the paste immediately after it has been dug from the ground and subsequently pressed and dried. Masses of moss, decayed twigs, or any decayed, or partially decayed vegetable substances, may be treated in a similar mann r. The solidifying of coal dust, peat, or other similar substances, for the purpose of converting them into an available fuel has been heretofore practised, by mixing it with adhesive substances, and, in some instances, subjecting the compound to pressure in moulds. The adhesive materials heretofore used, however, for this purpose, have been either pitch, resin, gas-tar, or compounds of these and similar materials, which melt during combustion and allow the mass to resume its original granulated form, in which it is ill adapted for use as a fuel. At the same time, these adhesive substances, when subjected to heat, give out disagreeable and noxious vapours, and interfere with the openings between the grate bars of the furnace in which the fuel thus prepared is used. The blocks of fuel prepared according to the above-described improvements, are free from these disadvantages, as the glutinous adhesive material cannot melt, and has no liability to burn faster than the substances with which it is mixed, so that each block or portion of a block retains its solidity until it is gradually consumed, precisely in the same manner as a block of coal of the same size. It will be evident that the glutinous size cannot cause any disagreeable smoky vapours, and that it can interfere with the grate bars to no greater extent than the coal itself.

MACHINERY FOR CLEANING RICE.

J. H. Johnson. *London and Glasgow*, (S. Donson *and* A. Fobes, *New York, U.S.*)—*Patent dated March* 14, 1860.

These improvements in cleaning rice consist in the application and use for that purpose of detachable and adjustable stone blocks, so shaped, that when combined they will form a hollow stone cylinder. In the interior of this cylinder revolves a vertical drum, having a number of overlapping strips of sheep-skin secured vertically by one edge to the surface of the drum. This drum is also provided with loose or hinged drags or scrapers which, by the action of centrifugal force, tend to fly outwards and scrape the surface of the stone cylinder, thereby removing any coagulated matter deposited thereon. As the stone wears away, the blocks are set up, by suitable set screws, to the proper gauge. On the lower edge of the drum one or more vanes or projections are formed for the purpose of winnowing off the chaff or light husks which would otherwise collect in the lower shoot which receives the dressed and cleansed rice. The rice to be treated enters at the top of the apparatus by a suitable shoot and hopper, and passes down between the surfaces of the stone cylinder and the revolving drum. If found desirable, a wire gauge cylinder may be used in lieu of the stone blocks.

Fig. 1.



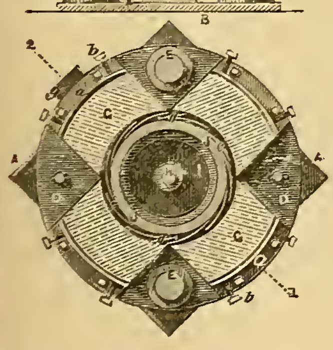
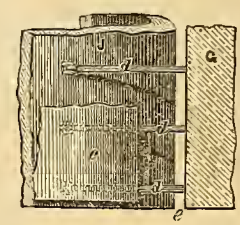


Fig. 2.

Fig. 1 is a sectional elevation taken on the line, 1, 2, fig. 2; and fig. 2 is a horizontal section of the same taken on the line, 3, 4, in fig. 1. A, is the base plate of the machine, secured to a suitable foundation, B, and to this plate are secured the four pillars, C, supporting an annular plate, D, on which rest the lower ends of the four stone blocks, G. These blocks are concave on the inside, so that when arranged on the annular plate, D, with their corners touching each other, the four blocks combined inclose a circular space equivalent to the interior of a hollow stone cylinder, as seen in figs. 1 and 2. Two of the pillars, E, are carried upwards above the annular plate, D, and are secured to a cap, or top-plate, F. On the under side of this cap-plate, F, and on the top of the annular plate, D, are secured flanges, which are furnished, *a*, with set screws, *b*, the points of which bear against the outside of the stone blocks, G, so that the latter can at any time be set up by turning the screws both at the top and bottom, as more fully described hereafter. H, is a vertical shaft turning at the bottom in a footstep on the base plate, A, and at the top in a central bearing of the top-plate, F, the shaft being driven by any suitable system of gearing. To this shaft are secured the upper and lower cast-iron plates, I, to which are attached the under staves, having their exterior turned perfectly true, so as to form the inner cylinder or drum, J. The diameter of this drum is such that an annular space of an inch or thereabouts shall intervene between it and the circle formed by the inner surface of the stone blocks, G. This drum is covered with sheep-skin in the peculiar manner best seen on reference to figs. 3 and 4, which represent a small portion of the drum respectively in vertical and horizontal sections. A series of vertical strips, *c*, of sheep-skin, or other suitable material, are secured at one edge only to the drum, the opposite edge which overlaps the adjacent strip being loose, and at liberty to fly out by the centrifugal force acquired by the velocity of the drum. At one or more points in the circumference of the drum are attached loosely a row of iron or steel rods or scrapers, *d*, part of which are covered by the sheep-skin strips, the other portions projecting from beneath the edges of the strips, as illustrated in figs. 3 and 4.

Fig. 3.



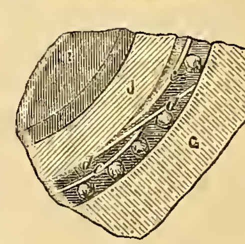


Fig. 4.

These scrapers are so loosely connected to the drum that they are at liberty to vibrate vertically, and to fly out by centrifugal force, thus bearing against the concave surfaces of the stone blocks, and removing therefrom the coagulated mass, which is apt to adhere to the surfaces of the stones when partially dried rice is operated upon. The rice to be cleansed drops from any elevated receptacle down a shoot on the cap, F, and through an opening in the latter on to the top of the drum, whence it rolls into the space between the sheep-skin covered periphery of the drum and the concave surface of the stone blocks. From this space the cleansed rice falls through the annular opening, *e*, between the plate, D, and the lower end of the drum, into the inclined and circular shoot or chamber, *f*, which is provided with a spout, *g*, to guide the grains of rice to any suitable receptacle. One, two, or more vanes, *h*, project from the lower end of the drum into the chamber, *f*, where, by the speed of the drum, they act as a fan for the purpose of preventing the accumulation of chaff in the shoot, *g*. It will be seen that the four stone blocks are confined to their proper position vertically by the plates, D and F, so that they cannot move inwards horizontally on account of their corners being in contact with each other, and that they are prevented from moving outwards by the set screws, *b*, in the flanges, *a*. As there is, invariably, a more dense body of the pellicles or skins of the rice nearer the lower than the upper portion of the stone cylinder, the surface of the lower portion of the stone blocks will wear away faster than the upper portions. When the lower ends have been worn to an extent which renders the cleansing operation uncertain, the screws, *b*, are turned, so that their points are free from contact with the stones. The upper plate, F, is elevated, the stone blocks are turned upside down, when the screws, *b*, are again tightened, and the upper plate, F, firmly secured to its place to the pillars, E. When the stone blocks are so far worn that they require setting up both at the top and bottom, they are removed from their places and the corners are chipped, after which, they are replaced between the plates, and the screws, *b*, are tightened until the chipped corners of the adjacent blocks touch each other.

SPRINGS.

W. A. Matthews, *Sheffield.*—*Patent dated October* 25, 1859.

This invention consists in longitudinally curving or angling the plates of which elliptical, flat, or similarly formed springs are composed, so as to bring the edges and centre of each plate above or below the neutral axis, thereby distributing the material in such a manner that only a small portion of the cross section of the plate is on the line of the neutral surface. By this improvement a great saving is effected in the weight of material used in the manufacture, and greater elasticity is obtained.

Fig. 1 of the accompanying figures represents a longitudinal section of an elliptical spring composed of plates of the improved construction; fig. 2 is a corresponding transverse section of the same, taken through the centre thereof; and figs. 3 and 4 are transverse sectional details of

Fig. 1.

Fig. 2.

spring plates of different shapes, constructed according to this invention. A, are the plates, each of which is curved or angled longitudinally as shown in the longitudinal and transverse sections, figs. 1 and 2, or modifications of the same, as shown in figs. 3 and 4. In fig. 2 the plate is represented as being curved in such a manner as to bring the edges below the vertical neutral axis. In another arrangement the edges are above the neutral axis, or the reverse of fig. 2. Fig. 3 represents a curved or angular plate, somewhat different from that represented in figs. 1 and 2, the edges of which are also below the neutral axes, but which admit of being turned in the reverse direction. In fig. 4, the plates are represented as being undulated, or corrugated longitudinally; but the curves may be arranged in reverse directions.

Fig. 3.

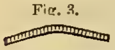


Fig. 4.

HOISTING MACHINES.

John Timmins, *Runcorn, Chester.—Patent dated January* 20, 1860.

The chief objects of this invention are to prevent cages and hoists falling in the event of the hauling rope breaking, and to remove the possibility of over winding the cage. The cage, A, is made somewhat of the usual form, with guides, *a*, for sliding over the conducting rods, *b*, and over it is placed a cover formed of an elastic steel plate, which, during the hauling up or lowering of the cage, will yield to the drag of the weight which it assists in suspending; but in case the hauling rope should break, will throw into action a set of catches which will gripe the vertical conducting rods and hold the cage in suspension. The coupling of the cage or hoist with the hauling rope is effected by two strong sliding bolts, B, at the top of the cage, through the intervention of a jointed or expanding hook, C, the tongue of which enters the metal eye, D, of the hauling rope. The eye has a guard plate, E, attached to it so as to prevent the tongue of the hook, C, from coming out except when in a vertical position, and having the weight of the cage upon it. Lateral projections are formed on the coupling hook for the purpose (in the event of the cage being raised too high) of being pressed upon by the ends of a stationary taper guide, F, and causing the hook to open and release the eye of the hauling rope. In the accompanying engraving, fig. 1 is a front view, partially in section; fig. 2, is a sectional elevation at right angles to fig. 1; and fig. 3 is a side view of a safety cage fitted according to this invention. A, is the cage consisting of a wrought iron framing constructed after the usual manner, and covered in with thin boiler plate iron. On the top of the cage is a cover, G, made of thin sheet puddled steel extending over the whole of the cage top, and along two of its opposite edges. This cover is secured in position by passing screws, *c*, through elongated bolt holes made in the cover, and screwing them fast to the boiler plate covering. By this attachment the steel cover, G, will be free to work between the fixed cover and the heads of the screws, *c*. The length of the bolt holes must be sufficient to allow of the middle of the cover, G, being lifted, say three or four inches, by the rope when taking the weight of the cage. The weight, however, of the cage is not thrown upon the cover, G, but upon the bolts, B, which pass through it; these bolts are secured to the steel plate or cover, A, by nuts on the under side thereof, and they pass through the fixed cover of the cage and through the main top bar, which extends across the cage to give strength to the upper part thereof. These bolts are made fast to the cage by nuts, keys, or other suitable means, and between these nuts and the cross bar metallic and India-rubber washers are placed on the bolts, B, to ease the sudden pull of the hauling rope when first put into action by taking the weight of the cage. Immediately under the top of the cage, two cross shafts, J, are mounted one on each side of the conducting rods, *b*, of the pit, and on each end of these shafts outside the cage is keyed catches, K, of a suitable form to bite into the wooden conducting rods as shown in fig. 3; these catches act in pairs, one pair on each side of the cage and thereby serve to sustain the cage at any required elevation. At about the middle of their length these shafts are each provided with bent arms or hooked shaped levers, I, the ends of which pass through slots made in the pendent ends of a kind of bracket piece, H, riveted to the under side of the steel plate or cover, G, of the cage. The use of this arrangement is to release the safety catches, K, from the conducting rods, *b*, when the rope takes up the weight of the cage. The tension put for this purpose on the rope by the winding machinery will cause the coupling chain, C, or other appliance which connects the rope to the cage to raise the steel cover, G, say, three or four inches out of its normal position (but not so far as to set it, or strain it out of its original form), and the rise of this cover will by reason of its connection with the levers, I, rock the shafts, J, and throw the catches, K, out of contact with the conducting rods. In case, however, the rope should break or become disconnected in any way, the steel cover, G, will act as a released spring, and by suddenly returning to its normal position, will throw the catches, K, into contact with the conducting rods, *b*, and arrest the descent of the cage. To prevent the engine man from pulling the cage over the head gear the expanding hook or clip, C, is employed; this hook or clip may form the upper ends of two coupling rods hinged to the top of the cage by the heads of the sliding bolts, B, direct, or by a similar hook, but having chains instead of the long links, C, secured to the lugs, or hinges of the

Fig. 1.

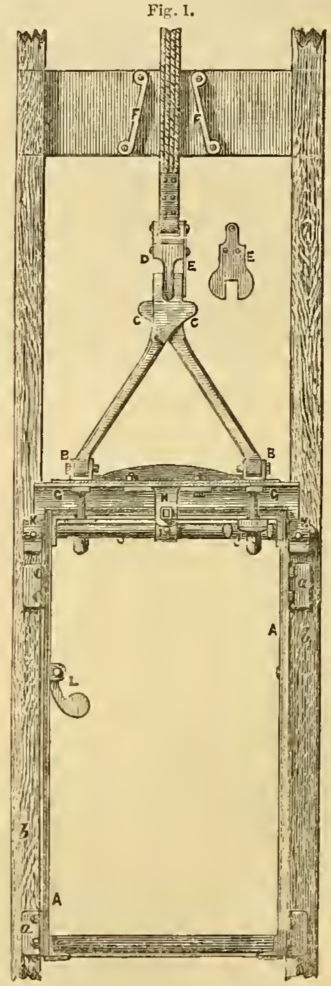
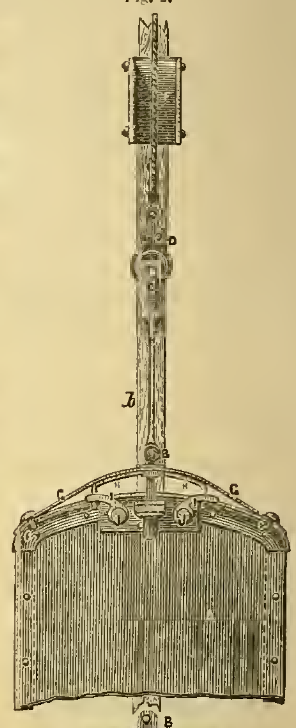


Fig. 2.



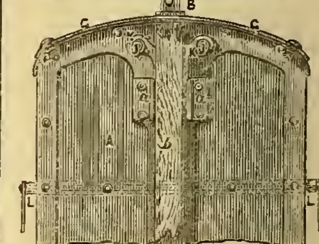


Fig. 3.

bolts, B, as shown in the engraving. The expanding two links of the hook is formed of forked side pieces, to one of which is attached a hook or tongue, which passes through the eye or end link, D, of the hauling rope, between the forked ends and the hook, and secures the connection between the rope and the cage. At the upper part, C, the links are provided with projections, which, when pressed together, will cause the hook to open and release its hold on the eye, D, of the rope. This disengagement is effected by the hook being carried upwards through a taper hole which is formed in a cross piece at the top of the conducting rods. This cross piece consists of two plates of iron bolted to the conducting rods, and between which are screwed two light castings, F, the bottom ends of which are put farther apart than the tops, thus forming the taper hole before spoken of. It will now be understood that if the projecting pieces are drawn up into this hole through the inattention of the attendant, the further progress of the cage will be instantly arrested without the chance of accident, the rope being disconnected and the cage left suspended in the head gear. This invention applies not only to cages for mines but also for hoists in other situations.

REVIEWS OF NEW BOOKS.

Screw-cutting Tables for the Use of Mechanical Engineers; showing the Proper Arrangement of Wheels for Cutting the Threads of Screws of any required pitch, with a Table for making the Universal Gas Pipe Threads and Taps. By W. A. Martin, Engineer. London: E. & F. N. Spon. 1860.

Time being often wasted, even by experienced workmen, in endeavouring to find wheels to cut any particular pitch of screw or broken member in consequence of the various changes to be obtained from the usual set of screw-cutting wheels, the writer has put together tables which will be of great use to those employed in this kind of work. His little book may be safely recommended to mechanics.

Pre-Adamite Man; or the Story of our old Planet and its Inhabitants told by Scripture and Science. London: Saunders, Otley, & Co. 1860.

This is the work of some clever lady, who has undertaken, like a thousand other readers of Scripture, to give the world a new interpretation, with a view to reconcile the apparent contradictions of scientific facts and biblical words.

"Truth cannot contradict truth; and we are therefore certain, that however difficult it may be for us in our ignorance to accommodate the facts of science with the infallible record contained in God's Word, there does not really exist in the universe any fact which sufficient knowledge would not perfectly reconcile with it. As well directed enquiry into the structure of our earth and heavens gradually unfolds the secrets of the universe, the harmony between the Bible and the rocks may be expected, therefore, to come out more and more clearly. But, in order to this result, it may perhaps be found quite as necessary to divest our minds of popular but unwarrantable interpretations of the former, however venerable by years or strong in the authority of great names, as to guard ourselves against crude theories in respect to the latter."

That this desirable reconcilement of fact and Scripture has never yet been accomplished is evident from the new attempts continually made, by thinkers who assume that all previous attempts are unsatisfactory. And the difficulty increases as new facts come to light, because the ground is ever changing. An interpretation which seemed at first to answer the purpose moderately well becomes in time utterly untenable, so that it is found necessary to propose new views and suggest a different solution for the problem. Dr. Buckland at one time contended that all fossil remains were relics of the Mosaic deluge. Afterwards he adopted the opinion that each of the six days of creation was a period of indefinite length. Chalmers believed that the operations of ancient geology were carried on before the narrative of the six days commenced, and that those days were only of the ordinary duration. Hugh Miller wrote a book to show that Chalmers was wrong, and to prove that the appearances presented by the various strata of the earth may be classified under the six successive periods indicated by the indefinite designation of "days," each, of course, lasting through ages. He thought that man was introduced on the scene quite at the close of the sixth epoch, and that the seventh was the Sabbath in which God ceased to work, which he blessed and sanctified, and which is now running its course. But the question which the authoress puts will at once suggest itself to every one. Could anything be less like the blessedness and stillness of the Sabbath rest than the events which have ceaselessly followed, marking the grand eras of the history of man? Mr. Gosse's notion, that God only placed the fossils on the rocks for the purpose of tricking man into the belief that the world is very old, when in reality it is quite young, can only excite a smile.

In the volume before us, the authoress tells us that she had been greatly embarrassed with the two accounts of the creation of man contained in the first and second chapters of Genesis, which accounts are usually thought to refer to one and the same event. In one place she finds that birds are said to have been created out of the waters; in the other place they are said to have been made out of the ground. Moreover, in the first chapter the lower tribes of animals are said to have been created before man; whereas in the second, the narrative runs that man was made previously to the coming into being of the lower animals. These discrepancies appeared incapable of being reconciled until she adopted the theory that two distinct acts of creation, belonging to periods far removed from each other, were referred to in these two chapters. If considered as referring to one period, the accounts are contradictory and the differences irreconcilable. In coming to a consideration of this question the writer admits the difficulty of throwing the mind open to new views, however much they may commend themselves to reason, on account of the early prepossessions and prejudices of education. This is a difficulty which all original thinkers have to contend against in the dissemination of new truths; and many minds are so constituted that their prejudices render them entirely proof against the strongest appeals of reason. Such minds revolt from the consideration of any views except those which are consistent with the notions they imbibed at a time when their reflective powers were in their infancy.

The theory now put forward is this: a race of men was created long before Adam was called into being; and this race "lived and reigned and fulfilled its destiny amid a condition of things of which the only extended record that remains is found in the leaves of the rocky book of the later tertiary age." In this way the traces of man, which have been lately discovered in numerous places, in strata of the tertiary age, are accounted for. They are the remains of a race which lived and became extended before the existing race was moulded out of the dust. Such is the hypothesis. It is founded first upon the contradictions of the Scripture narrative; and next, upon the discovery of the works of man's art in strata of great antiquity, which latter alleged fact must pass through the same ordeal of opposition that the fact of the enormous antiquity of the earth had to pass through, before it will be admitted as indisputable. Whether the authoress, however laudable her aim, has done more than put into stronger light the discrepancies of the biblical text may be a matter of doubt. She has, however, written a book which, from its easy style and the attractiveness of the subject, to all who do not think themselves bound to pin their faith to another man's sleeve, will be much read.

Ure's Dictionary of Arts, Manufactures, and Mines. Part XII. New Edition. Longman & Co. 1860.

This part has articles on Paper Cutting, Paper Manufacture, Perfumery, Photography, Potash, Pottery, and Printing, besides several subjects of less importance.

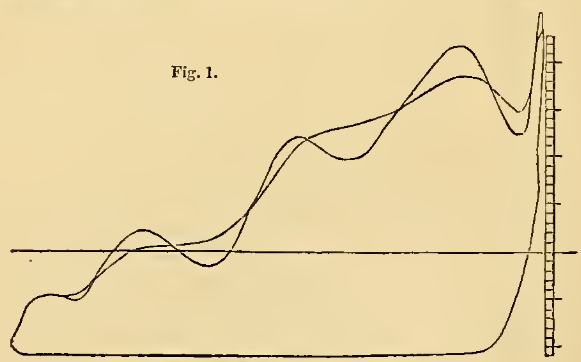
CORRESPONDENCE.

MARINE ENGINEERING ON THE TYNE.

I enclose you a diagram from the last pair of marine engines fitted on board the *Rangoon*, and which I have started here. On the trial trip of

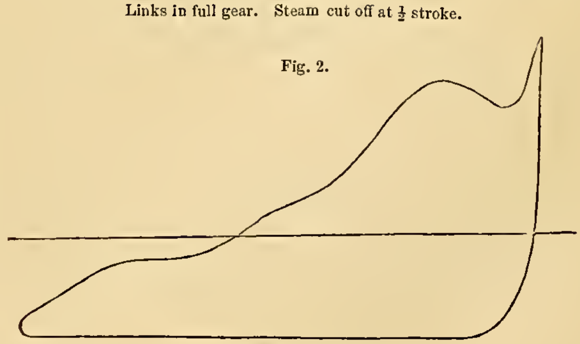
Diameter of Cylinders,	42 inches.
Length of Stroke,	2 feet.
Revolutions per Minute,	80.
Consumpt of Fuel per hour with links in full gear,	9 cwt.
Steam Superheated,	
Temperature of feed water,	180°

Fig. 1.



80 Revolutions.
Links in full gear. Steam cut off at ½ stroke.

Fig. 2.



76 Revolutions.
Steam cut off at ½ stroke.

seventy miles, the speed of the ship under fair steaming alone—no aid from canvas—was thirteen and a half miles per hour. The consumption of coal was, as stated above. The boilers have steam superheating apparatus, and the feed is also superheated by exhaust steam, ass's.ed by the escape from the steam jackets of the cylinders, which is made to mix with the feed water, thus returning all available heat into the boilers. The boilers are also fitted with an ordinary smoke prevention apparatus which answers completely. I think you will admit that this shows that with ordinary engines there is economy to be obtained, to about the same extent as with the most complicated forms, such as have been so lauded into vogue recently.

The ship is for the Calcutta and Burmah Royal Mail Company, and is a very superior specimen of ship building; in fact, so far as material and workmanship is concerned, except in the joiners' department, she will stand comparison with anything built on the Clyde. The wood work is all solid teak, and the cabins embody a combination of teak and rosewood, with chaste brackets and cornices, relieved in gold. The ship is over all 215 feet long; breadth, 27 feet; depth 15 feet, 6 inches; tonnage, B.M., 750; gross, 500. She is full brig-rigged, and has a lifting screw. The *Rangoon*, in which these engines are fitted, was built by Messrs. Pile, Spence, & Co., West Hartlepool.

George W. Jaffrey.

Hartlepool Iron Works,
Hartlepool, October, 1860.

RAISING STEAM.

If water be separated into small particles, less heat is necessary to raise steam.

I had two small tin pots of the same size made, the one fitted with a small screw or blade, attached to a crank with wheels, which, turning with the hand, went with great velocity. By this means the water was broken into small globules, and on a hot plate steam was raised nine minutes before that in which no blade or screw was attached. I found also, that after steam was raised in each pot, that with half the cost the steam was kept equal to that in the other pot.

It might be worth the attention of parties interested, to test whether the loss of power to drive the blades would not be greatly compensated by the saving in fuel. I believe it would.

Glasgow, Oct., 1860. Robt. M'Gavin.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

THE BRITISH ASSOCIATION AT OXFORD, 1860.

The following is a list of the papers read, with a resumé of the more interesting ones:—

Section G.—Mechanical Science.

"An interim report on the gauging of water," by Prof. J. Thomson, of Belfast.

"Report of the committe on steamship performance."

"On the performance of steam-vessels," by Admiral Moorsom.

Admiral Moorsom described the points which, in various papers laid before the British Association, he has brought into issue, and for the determination of which, data—only to be obtained by experiments—are still wanting, viz:—1. There is no agreed method by which the resistance of a ship may be calculated under given conditions of wind and sea. 2. The known methods are empirical, approximate only, and imply smooth water and no wind. 3. The relations in which power and speed stand to form and to size are comparatively unknown. 4. The relations in which the *direct* and *resultant* thrust stand to each other in any given screw, and how affected by the resistance of the ship are undetermined. In order to resolve these questions, specific experiments are needed, and none have yet been attempted in such manner as to lead to any satisfactory result. The steam-ship performance committee of the British Association have pressed upon successive Lords of the Admiralty the great value to the public service which must ensue if the following measures were taken, viz:—1. To determine by specific experiment the resistance, under given conditions, of certain vessels, as types; and, at the same time, to measure the *thrust* of the screw. 2. To record the trials of the Queen's ships, so that the performance in smooth water may be compared with the performance at sea, both being recorded in a tabular form, comprising particulars, to indicate the characteristics of the vessel, of the engine, of the screw, and of the boiler. Hitherto nothing has come of these representations. Admiral Moorsom entered into very minute details as to the construction and results in speed of various ships of war. He concluded his discourse in these words:—"More than one hundred years ago, scientific men, able mathematicians, showed the physical laws on which naval architecture must rest. A succession of able men have shown how those laws affect various forms of floating bodies. Experiments have been made with models to determine the value of the resistance practically. With the exception of some experiments of Mr. Scott Russell, I am not aware that any have been made with vessels approaching the size of ships, to determine the relations of resistance to power, whether wind or steam. Ships have been improved, and modifications of form have been arrived at by a long, painstaking, tentative process. The rules so reached for sailing ships have been superseded by steam, and we are still following the same tedious process, in order to establish new rules for the application of steam-power. I think the history of naval architecture shows that it is not an abstract science, and that its progress must depend on the close observation and correct record of facts; on the careful collating and scientific comparing of such facts, with a view to the induction of general laws. Now, is there anywhere such observing, recording, collating, and comparing; and still more, is there such inducting process? I can find no such thing anywhere in such shape that the public can judge it by its fruits. We are now in full career of a competition of expenditure, and England has no reason to flinch from such an encounter unless her people should tire of paying a premium of insurance upon a contingent event that never may happen; and if it should happen without our being insured, might not cost as much as the aggregate premiums. Tire they will, sooner or later, but they are more likely to continue to pay in faith and hope, if they had some confidence that their money is not being spent unnecessarily. There is now building at Blackwall, the *Warrior*, a ship to be cased with 4½ inch plates of iron, whose length at water-line is 380 feet, breadth 58 feet, intended draught of water, (mean) 25½ feet, area of section, 1,190 square feet, and displacement about 8,992 tons, and she is to have engines of 1,250 nominal horse power. Is there any experience respecting the qualities and performance of such a ship? —anything to guide us in reasoning from the known to the unknown? Do the performances of the *Diadem*, the *Mersey*, and the *Orlando*, inspire confidence? Where are the preliminary experiments? Before any contract was entered into for the construction of the Britannia Bridge, a course of experiments was ordered by the directors, which cost not far short of £7,000,—and it was well expended. It saved money, and perhaps, prevented failure. This ship will cost not less than £400,000, and may cost a good deal more when ready for sea. But there is another of similar, and two others building of smaller, size. What security is their for their success? The conditions which such a ship as the *Warrior* must fulfil in order to justify her cost are deserving of some examination. The formidable nature of her armament, as well as her supposed impregnability to shot, will naturally lead other vessels to avoid an encounter. She must, therefore, be of greater speed than other ships of war. To secure this, it is essential that her draught of water should be the smallest that is compatible both with *stability* and *steadiness* of motion, and that she *should not be deeper than the designer intended.* To ensure steadiness, it is necessary, among other things, that in rolling, the solids, emerged and immersed, should find their axes in the longitudinal axis of the ship. To admit of accurate aim with the guns, her movement in rolling should be slow and not deep. Every seaman knows how few ships unite these requisites. It is not quite safe to speculate on the *Warrior's* speed; nevertheless, I will venture on an estimate, such as I have stated in the case of the *Great Eastern*, whose smooth water speed I will now assume to be 15¾ knots, as before estimated, with 7,732 horse-power, when her draught of water is 23 feet, her area of section, say, 1,650 square feet, and her displacement about 18,588 tons. The speed of the *Warrior* in smooth water ought not to be less than 16 knots, in order that she may force to action unwilling enemies whose speed may be 13 to 14 knots. The question I propose, is the power to secure a smooth-water speed of 16 knots. Reducing the *Great Eastern* to the size of the *Warrior*, and applying the corrections for the difference of speed of ¼ knot, and for their respective co-efficients of specific resistance, ·0564 and ·07277; the horse-power for 16 knots is 7,543. Raising the *Niagara* to the size of the *Warrior*, and applying the corrections for the difference of speed between 10·9, and 16 knots, and for their respective co-efficients of specific resistance ·0797 and ·07277, the horse power to give the *Warrior* a smooth-water speed of 16 knots is 7,867, being an excess over the estimate from the *Great Eastern* of 324 horse-power. If the power required for the *Warrior* be calculated by adaptation from the *Mersey* and the *Diadem*, it would be 8,380 horse power, and 8,287 respectively, from which this inference flows: that unless the mistakes made in the fore and after sections of the *Mersey* and the *Diadem* are rectified in the *Warrior*, she will require above 8000 horse power for a speed of 16 knots, notwithstanding her greater size and increased ratio of length to breadth. Before investing more than a million and a half of money in an experiment, commercial men would have probably employed a few thousand pounds in some sort of test as to the conditions of success. Perhaps such test may have been resorted to and kept secret for reasons of public policy. Perhaps it is intended that the *Warrior's* speed should not be greater than that which is due to five times her nominal horse-power, which could not exceed 15½ knots with 6,250 horse-power, under the most favourable conditions, and may be much less. The British Association, by becoming the medium of collecting facts and presenting them to the public, has done good service; but that service ought not to rest there. Collectively, the Association may be able to do little more. It can only act by affording public opinion a means of expression. But individual members may do much. Towards such opinion I am doing my part. I ask, in the cause of science, what is the system under which the Queen's ships are designed and their steam power apportioned, the organization by which their construction and fitting for sea are carried on; the supervision exercised over their proceedings at sea, in the examination of returns of performance and of expenditure? During part of 1858 and 1859, two committees appointed by the Admiralty collected evidence and made reports on the dockyards and on steam machinery. I have read both reports with some attention. They are not conclusive, but they are entitled to respect. I have also read the replies and objections of the Government officers. There is a clear issue between them on some of the most essential principles of effective economical management, and on the application of science. A royal commission has been appointed to inquire into the system of control and management in the dockyards. This is so far good, but it does not go far enough. It does not comprise the steam machinery reported on by Admiral Ramsay's committee, and it cannot enter upon the questions I have just enumerated. Yet the efficiency of the fleet depends quite as much upon the adaptation of the machinery to the ship, and of the ship to the use she is to be put to, as it does upon the manner in which she is built. The commission ought to be enlarged both in objects and in number of members. It consists of five only."

A lengthened discussion followed the reading of this paper.

Admiral Fitzroy fully concurred in the great importance of the subject discussed in the paper. In his opinion the change which steam had introduced into our navy did not in any way tend to lesson the necessity for reliance on our ships as our national defences. No method on land would be found equal to our floating batteries, whether of wood or of iron. Steam was a question for practical engineers, and goverment must look to them for its solution. He thought Admiral Moorsom had done good service in perseveringly calling attention to it. Of late years, he thought the Americans had gone ahead of us in this matter; but we ought to have no shame in following their lead.

Mr. W. Fairbairn said the rules formerly laid down were useless. Each day we were learning a fresh lesson. Our knowledge as regards steam was in a transition state. Government should make a grant of money, so that reliable experiments on a large scale might be made.

Mr. Carpmeal, C.E., in answer to one portion of Admiral Moorsom's paper, said he thought it would be easily seen what had induced the government to make certain experiments in reference to cutting off the forward and outermost corners of the screw-propeller, and in reference to Griffiths' propeller, when it was recollected that General Sir Howard Douglas, in his work on Gunnery, published some years ago, had called attention to the prejudicial effect produced by the use of the screw-propeller, as then formed, in the steering of ships, and also the great vibration, which resulted from its use; both of which effects Sir Howard suggested arose from the same cause,—viz., the striking of the forward edge of each blade of the Admiralty screw then in use against the quiescent water, and it was his recommendation that the forward corners of the screw-blades should be removed, and the edge curved, in the place of being straight. The results of the Admiralty experiments showed that, by adopting this suggestion, the steering was improved, the vibration lessened, and the speed increased. As regards Griffiths' form of screw, the Admiralty had made their experiments on it owing to the favourable results which Mr. Griffiths had obtained in the merchant navy being pressed upon them. Griffiths' propeller had a two-fold action; first, he stopped out the central portion by a boss on the propeller shaft, in order to reduce the waste of power from the use of the parts of the screw-blades nearest the axes, which are known to give but little propelling effect as compared with the power expended on them; secondly, he reduced the widths of the screw-blades as they departed further from the axes of motion, on the principle that the outermost parts, having higher and higher velocity through the water, they require less and less extent of surface to produce the best effect, and that any excess in extent of surface beyond what acts advantageously, produces additional and useless friction.

Mr. Froude pointed out that the position usually assigned to the screw in close juxtaposition with the heavy lines of the ship's run involved a partial diminution of the hydrostatic pressure under the after body, and a corresponding forced retardation. There was also a second, and, practically, more serious evil, due to the position of the screw boxed up between two stern-posts, and this was felt with immense effect in line-of-battle ships, and others, built of timber. In the *Duke of Wellington*, the stern posts are thirty inches thick; and the nature of the evil would be understood by observing that, when the screw is lifted out of the water, and the ship is going ahead under canvas, the whole of the space between the stern-posts is filled with water, which travels with the ship and at the same velocity, and as part of her mass. When, however, the screw is lowered into its place, and in rotation, it follows that, twice in each revolution, the whole mass is dispersed with a velocity due to the speed of the screw, while the conditions which originally placed it there immediately come into operation, and replace it. The dispersion involves a very heavy shock on the shaft of the screw; but since the water of replacement must be taken up from that through which the ship is passing with full speed, and is compelled to assume that speed, the result is equivalent to a very heavy retarding force, which fully neutralizes the forward effort of the shock on the screw-shaft. In the *Duke of Wellington*, the mass of water thus dispersed and replaced, in each semi-revolution, cannot be short of 200 cubic feet, and if the ship be going ten knots, and making sixty revolutions, the retarding force must be about 13,000 lb., out of the whole propulsive force (probably, 60,000 lb.) which the screw developes. He then drew attention to the phenomena of the wake, or the current of water created by the transit of a ship, and the function of this in reference to propulsion; and showed, by reference to dynamical principles, that the two sternward currents which the paddles create, must possess a sternward momentum exactly equal to the forward momentum of the wake, and could the currents meet the wake, would precisely neutralize one another, as far as forward motion is concerned. The screw, however, acts in the line of the wake, which, therefore, is exactly stopped by the effort of propulsion; and, while with the paddle-wheel "slip" is essential, could the screw be made to act to the best advantage on the wake, it would be theoretically possible to obtain the propulsion without slip. The screw would propel the vessel by simply stopping the forward current, without having to create a sternward one. Placed as it is it acts imperfectly on the wake, and realizes but a small part of its inherent advantages, yet still gains so much as to make up in part for the disadvantages of its position. Could the screw be placed quite clear of the stern, it might realize the full benefit of the wake, and avoid all the factitious resistances already described; and those shocks which can be only palliated by such remedies as cutting off the angles of the screw-blades, would be got rid of altogether. He wished to add something on the rolling motion of ships, a subject he had carefully investigated at the late Mr. Brunel's request, in connection with the *Great Eastern*. He had long been of opinion that the heavy rolling of a ship depended on her own periodic time,—considering her as a pendulum,—concurring with the periodic recurrence of the waves; and this view was verified both by his practical and theoretical investigations. The periodic time of a ship as a pendulum, might readily be calculated with tolerable accuracy, as it depended on the ship's stability, and on her moment of inertia; and he had found that the period must be almost exactly the same when the ship was rolling naturally on the waves, as when she was set rolling in smooth water. This depended on the curious proposition, that the surface of a wave was virtually level to a body floating on it, and that on such a floating body as exactly followed the motion of the wave a plumb-line having its "bob" level with the water,—or the bubble of a spirit-level similarly placed,—retained their stationary central position, whatever might be the angle of the wave. He had seen a little cork float like a life-buoy, carrying a central plum-bob thus undisturbed in its centre, while it was on the hollow underside of a heavily-breaking surf, though the bob was actually above the point of suspension. This depended on a fundamental proposition in hydrodynamics, which showed that the angle of a wave's surface was in exact correspondence with the translatory acceleration to which the particles forming the surface were subject. If we could carry a cupful of water without spilling it, we must "cant" it to an angle corresponding with the force we use to put it in motion. By help of this proposition it was possible to construct a differential equation, showing, with a very near approximation, what will be the position of a ship at any moment on a series of waves of equal period; and it appeared, that if their period of recurrence were identical with that in which she would oscillate as a pendulum, about five successive waves would bring her on her beam-ends, supposing her oscillation to take place without friction; though a very small deviation of the wave from that period would thwart the oscillation, and bring the ship to rest. The *Duke of Wellington*, on her voyage home from Lisbon, afforded a complete verification of these views. The ship's periodic time had been ascertained to be twelve seconds, and in her previous trials in the Baltic and narrow seas, where waves are not formed having so slow a period, she had never been known to roll seriously; yet, on the occasion referred to, when she encountered a three days' gale in the Bay of Biscay, and the seas then attained a twelve-second period, the ship astonished all who had previously known her by making rolling excursions amounting to full 20° off the perpendicular. The same results were shown even more distinctly, by experiments with floating bodies in a trough; and in addition, it became clear that the degree of rolling was almost entirely independent of the sectional form of the floating body,—that is to say, a sphere immersed to half its radius, to its whole radius, or almost totally, will oscillate as nearly as possible alike in the same waves, provided, in each case, it is so loaded as to possess the same period; and he fully believed the same law held good as regards the forms of ships. The reason why Symonite ships rolled excessively, was not any special feature in their midship section, but that they possessed an excess of stability, and therefore a quick period of rolling, and therefore more readily fell in with waves of corresponding period. And, conversely, if we so rob any ship of her stability as to render her liable to be blown over by the slightest breeze, we shall find that, owing to her slow period, no wave that exists will be able to set her into oscillation.

Admiral Moorsom said that the French acted on a different principle from ourselves, they used a screw of small diameter and with six blades, whilst we used screws of large diameter.

Mr. P. W. Barlow then read a paper "On the mechanical effects of combining suspension chains and girders, and the value of the practical application of this system," (illustrated by a large model.)

Mr. E. Cowper said that, in his opinion, danger would result from the rapid wear and tear of the rivets joining the links of the chain; and he suggested and described a bridge, on the suspension principle, formed of boiler-plate of such a curve above, and such a horizontal line below for supporting the platform, and of such depth as to include in it all the curves of distortion which the catenary would undergo when subjected to the varying load of trains passing over a bridge suspended from it. This combined the necessary rigidity with the suspension principle.

Mr. Walter Hale read a paper explanatory of a process for covering submarine wires with India rubber for telegraphic purposes, and exhibited a model of his machine, which effected the object by winding strips of rubber, previously moistened with naphtha over the wire; and the whole being afterwards subjected to a temperature of 140°. The wires thus covered were protected with a plaited covering of hempen cord, into which longitudinal steel wires were introduced for the purpose of giving strength.

Messrs. Werner and C. W. Siemens then described their mode of covering wires with India-rubber, and exhibited a very ingenious machine for accomplishing this object. These gentlemen use no solvent or heat whatever, but take advantage of the property which india-rubber possesses of forming a perfect junction when newly-cut surfaces are brought together under pressure. The core or wire, with the ribbon of rubber applied to it longitudinally, is pushed into an orifice, which serves as a guide to carry them into the machine, so that the superfluous rubber is cut off by what may be termed a revolving pair of scissors, formed by a disc of steel with a sharp edge revolving eccentrically against a stationary plate, and immediately, by means of two grooved wheels, the edges are pressed together, and thus the wire becomes encased in a perfect tube of India-rubber. As many additional tubes as may be desired can be then put on. The machine is also applicable to the coating of wires with what is known as Wray's compound, a material of very high insulating power, combined with very low inductive capacity.

The Earl of Caithness read the following paper "On road locomotives."

"My present object is not to enter into any detailed history of the steam engine from its commencement, or to trace its gradual improvement, but to place before you, as briefly as possible, some of the advantages that may accrue from it as a means of transit on our common roads.

The public mind is usually set against anything new. When steamers were first spoken of they were looked on as a wild and dangerous expedient. They would be constantly on fire, would not, or could not, go to sea, and if they did, who would be found mad enough to go with them? Mr. Miller, of Dalswinton, found this to the cost of mind and person: and Mr. Bell, though more successful with his first boat on the Clyde, had his battle to fight against public opinion. Railways at first were looked on as wild and visionary, and dangerous in the extreme to her Majesty's subjects. Thanks to George Stephenson, his perseverance had its reward, not only to himself, but in a much larger degree to us.

My object is to lay before you what in my opinion may some day work nearly as great a benefit to society as our railways. The subject is not new, but I am not aware that it has ever been brought before the British Association. It is road locomotion by steam. It seems the more important at this time to discuss the subject, as at present a bill is before Parliament to enact certain tolls on locomotives; and so much fear is expressed by various parties as to the freedom from danger of these machines, that I think it a favourable opportunity to bring the subject before the meeting. Various plans have been tried, and vast sums of money expended, in endeavouring to perfect a good road locomotive. Watt designed one to carry two persons, but it was not constructed, his other employment taking up so much time as to prevent him carrying it out. The first actual steam carriage we read of was made by a Frenchman named Cugnot, who showed it to Marshal Saxe in 1763. He afterwards made one that, when first set in motion, went through a wall, and being by this means, or other violent exhibition of its powers, considered dangerous, was placed in the arsenal museum at Paris, where it now is. An American, Oliver Evans, also invented a steam carriage in 1772, but it did not come into use. William Symington conceived the same idea for Scotland, but the roads were then so bad, that to speak in a slang way it was "no go;" this was in 1786. The next inventor was William Murdoch, who in 1784 made a model of a steam carriage which is still in possession of a relative of Murdoch's. Another inventor of steam carriages was Thomas Allan of London, who in 1789 designed one to carry goods and passengers.

The most successful, however, seems to have been a locomotive built by Richard Trevethick, of Cornwall, and Andrew Vivian, his cousin (Trevethick was a pupil of Wm. Murdoch). He took out a patent for it in 1802. His carriage was like a common stage coach. It had only one cylinder. This was the first successful engine made to work with high pressure, moving the piston both ways against the pressure of the atmosphere only. The first road steam carriage was, on the whole, wonderfully successful. It caused great excitement in his neighbourhood. This carriage safely reached London, and was publicly exhibited on an inclosed piece of ground where Euston station now stands.

Having thus shown that in the early days of steam, carriages were made and driven on common roads, I am about to bring the subject before this meeting, in the hope if it is now taken up and backed by the British Association, we shall have this most useful, and now well understood power, brought to bear as a most efficient means of conveying heavy goods and passengers, as tenders to our railways, instead of making so many short branches of railways which do not pay.

Mr. Scott Russell, many years ago, made a successful steam carriage that ran between Glasgow and Paisley; and if it had not been for a most unfortunate misunderstanding between the promoters of the carriage and the road trustees, whereby a fatal accident took place, I believe it would then have made a great stride in the right direction. It performed its journey very well for some time.

One of the great reasons why we may now look for success in road locomotives is, that instead of us formerly having a heavy machine or carriage worked with a comparatively light pressure of steam, we now have a light carriage, and worked at a heavy pressure. We now have the means of making very strong boilers very light, and to stand a high pressure.

A number of plans have been tried, all more or less successful. The first that came out of late was Mr. Boydell's, with its endless railway attached to its wheels. This carriage, though I have not seen it at work, has, I understand, drawn great weights after it, at a cost much less than that of horse power; and though clumsy in appearance, yet that may be got over. The first thing in my mind is to establish the actual working of this mode of hauling.

We have now another, and also a most successful steam carriage in Mr Bray's. It is very ingenious. It has now been working for some time with perfect success; and though it was unfortunately transmogrified last year into a green dragon, and for a time gave in, yet there is no reason why it should not turn out a most useful machine. Indeed it has proved itself so a great many times within a few months, in taking large loads through London. It has drawn over thirty tons through the most crowded thoroughfares of London, and in no instance has any accident occurred during its employment. The economy in its use has been equal to a saving of one half the cost of employing horse-power.

Mr. M'Connell, to whom the world is largely indebted for very valuable improvements in the locomotive engine; has, I believe, undertaken to give his able attention to this subject with a view to bring out a simpler engine than that now in use. This I feel can be done with ease, so as to make a much more workable and less costly machine. I think great speed should not be looked for in traction engines. What is wanted, in my opinion, is a means of taking large loads at a small cost. It is a great mistake to suppose that injury is done to the road by the use of steam carriages. The truth is, that there is much less injury done than by using horses—the broad wheels acting like rollers, and so rather improving than hurting the road.

The Marquis of Stafford has had a small steam carriage in use now for two years, and it works with great ease. It was made by Mr. Rickett, of Castle Foundry, Buckingham. Since it was made, Mr. Rickett has made two others, introducing great improvements, being direct acting instead of being driven by a pitch chain. One of these carriages has been built for myself. It weighs one ton and a half, and I have had a speed of nearly twenty miles an hour out of it. I gave a suggestion as to the mode of placing the axle in connection with the driving gear, which I will explain. I placed the axle of the road wheel in radial segments, so that as the springs rise and fall by the action of the road the driving gear or toothed wheels are never allowed to be at a greater distance from each other at any time; the axle, as it rises or falls, performing a part of a revolution round a crank shaft, on which is fixed the smaller wheel which gives the action to the road wheels. Its action is perfect, as the teeth of the wheels are always in gear to the same depth; and the consequence is, that the springs act most perfectly, and it goes along the road without trouble. I have now had several trips on it from Buckingham to Wolverton a distance of ten miles, and this has been done within the hour, including stoppages.

Another advantage of steam on roads over horse power is, that instead of requiring twenty or thirty horses, forming quite a troop, to take a carriage containing some heavy weight, you place before the said carriage a steam engine. This power will cost but a small sum in comparison with horses: it will be a constant power so long as it gets coal and water. It will take up but little room, not being much larger than a common carriage. This seems a most important reason for the advancement of steam as at this present day saving of time, money, space, and at the same time gaining increase of power, are cogent reasons for advocating any cause."

Mr. J. Elder read a paper descriptive of a new form of steam-engine boiler, termed "a cylindrical spiral boiler," and described the advantageous results after a very lengthened trial.

Mr. E. Cowper read a paper descriptive of "a new mode of obtaining a blast of very high temperature in the manufacture of iron." The blast is obtained by an adaptation of the principle of Siemens's regenerative furnaces. A hot blast of a temperature of 2,000° Fahrenheit can readily be obtained, and this without the destruction of iron tubes—the substance used in contact with the air being the most refractory fire-brick. This mode of obtaining a blast was in successful operation at Messrs. Cochran's iron-works. The temperature of the blast could be regulated to any required degree. The heat might be obtained from the combustion of the waste gases of the furnaces, and with greater economy than by any method hitherto known for economizing these gases.

Mr. W. Fairbairn read a paper "on the density of saturated steam, and on the law of expansion for superheated steam."

"At the last meeting of the British Association, I detailed a new method of ascertaining the specific gravity of vapours, which, in conjunction with my friend Mr. Tait, I was employing with a view to ascertain the density of steam at all temperatures. It may be of interest to the Association to know, that I believe the method to have proved itself reliable, and that we have now experimental determinations of the density of steam; and these fully verify the anticipations of Mr. Thomson and Mr. Rankine, that the vapour of water does not accurately obey the gaseous laws. We have found the density of saturated steam always greater than that given by gaseous steam, even for temperatures as low as 136° Fahr., and for pressures less than that of the atmosphere.

The experiments as they stand at present extend over a range of temperature from 136° to 292° Fahr., or from 2·6 to 60lb. pressure per square inch. But as we hope to extend them to higher pressures, I have preferred to leave at present the consideration of their bearing on other formulæ, and the ultimate generalisations to which they may lead in regard to the use of steam. The following simple formula, however, very nearly expresses the results of the experiments as to the density and pressure of saturated steam, the relation between pressure and temperature having been already determined with scrupulous accuracy by the elaborate investigations of Regnault.

Let V be the specific volume of the steam or volume as compared with that of an equal weight of water; P = the pressure in inches of mercury. Then I find

$$V = 25{\cdot}62 + \frac{49513}{P + {\cdot}72}$$

Table of Results, showing the Relation of Density and Pressure of Saturated Steam.

No.	Pressure. In lbs. per square inch.	Pressure. In inches of mercury.	Temperature Fahrenheit.	Specific Volume. From experiment.	Specific Volume. By formula.	Proportional error of formula.
1	2·6	5·35	136·77	8266	8183	+ 1-100
2	4·3	8·62	155·33	5326	5326	0
3	4·7	9 45	159·36	4914	4900	— 1-350
4	6·2	12·47	170·92	3717	3766	+ 1-74
5	6·3	12·61	171·48	3710	3740	+ 1-123
6	6·8	13 62	174 92	3433	3478	+ 1-76
7	8·0	16·01	182·30	3046	2985	— 1-50
8	9·1	18·36	189·30	2620	2620	0
9	11·3	22·88	198·78	2146	2124	— 1-97
1	26·5	53·61	242·90	941	937	— 1-235
2	27·4	55·52	244·82	906	906	0
3	27·6	55·89	245·22	891	900	+ 1-100
4	33·1	66·84	255·50	758	758	0
5	37·8	76·20	263·14	648	669	+ 1-32
6	40·3	81·53	267·21	634	628	— 1-100
7	41·7	84·20	269·20	604	608	+ 1-150
8	45·7	92·23	274·76	583	562	— 1-29
9	49·4	99·60	279·42	514	519	+ 1-100
11	51·7	104·54	282·58	496	496	0
12	55·9	112·78	287·25	457	461	+ 1-114
13	60·6	122·25	292·53	432	428	— 1-108
14	56·7	114·25	288·25	448	446	+ 1-56

The above table exhibits accurately the results at which we have arrived in regard to saturated steam; we have also obtained some results on the rate of expansion of superheated steam. These results are at present less complete than those upon saturated steam, as they do not range more than 20° of temperature in each case above the maximum temperature of saturation. They appear, however, to show conclusively, that near the saturation point steam expands very irregularly, thus agreeing with what we know of other bodies in their physical relations at or near the point at which they change their state of aggregation. Close to the saturation point we find a very high rate of expansion, but this rapidly declines as the steam superheats, and at no great distance above it the rate of expansion nearly approximates to that of a perfect gas.

Thus, for instance, in experiment 6, where the point of maximum saturation was 174·92°, between this and 180°, the steam expanded at the rate of $\frac{1}{190}$ whereas air would have expanded $\frac{1}{634}$; but on continuing the superheating, the co-efficient was reduced between 180° and 200° from $\frac{1}{190}$ to $\frac{1}{637}$, and for air the co-efficient would have been $\frac{1}{639}$ or almost exactly the same, and this rule holds good in every experiment; a high rate of expansion close to the saturation point diminishing rapidly to an approximation to that of air."

"On rifled cannon," by Capt. Blakeley.

The writer pointed out that to make an efficient rifled gun, no more was needed than to copy any good small rifle in the number and shape of the grooves, degree of twist, and other details, provided one difficulty was overcome, viz., that of making the barrel strong enough. Taking Sir W. Armstrong's 80-pounder as a standard, Capt. Blakeley gave several examples of large rifled cannon on the model of successful small ones, which had given satisfactory results in every way, except that they had failed after a short time for want of strength. Mr. J. Lawrence, in 1855, rifled a 6½-inch gun with three shallow broad grooves, like an Enfield, and fired a lead and zinc bullet, like the Enfield. At an elevation of 5°, the range was 2,600 yards—150 more than Sir W. Armstrong's; but the gun burst after about 50 rounds. Mr. Whitworth, after making some excellent small arms and nine-pounders, tried a large gun with 4 inches bore, and sides 9 inches thick; but it burst. He then tried another, 11 inches thick, and it, too, burst. He, had, however, since made a stronger cannon, whose success was absolute proof that the one thing wanting in the other was strength. Capt. Blakeley explained his own method of obtaining strength, which consists simply of building up the gun in concentric tubes, each compressing that within it. By this means the strain is diffused throughout the whole thickness of the metal, and the inside is not unduly strained, as in a hollow cylinder made in one piece. As the whole efficacy of the system depended entirely on the careful adjustment of the size of the layers, Capt. Blakeley said he was not astonished that Sir W. Armstrong had lately failed utterly in his attempts to carry it out, because he did not put on the outer layers and rings with any calculated degree of tension; "they were simply applied with a sufficient difference of diameter to secure effectual shrinkage," to quote his own words at the Institution of Civil Engineers. To show that the late failure by Sir W. Armstrong did not disprove his, Capt. Blakeley's theory, he quoted official reports of a trial of a nine-pounder made by himself in 1855, which showed an endurance sevenfold that of an iron service gun, and threefold that of a brass gun, as well as of an 8-inch gun, from which bolts weighing 4 cwt. had been fired, and of a 10-inch gun which had discharged bolts weighing 526lb. Mr. Whitworth's last new 80-pounder was another instance of the successful application of Capt. Blakeley's principle. To quote Mr. Whitworth's own words,—"It was made of homogenous iron. Upon a tube having an external taper of about one inch, a series of hoops, each of about 20 inches long, were forced by hydraulic pressure. Experiments had enabled him to determine accurately what amount of pressure each hoop would bear. All the hoops were put on with the greatest amount of pressure they would withstand without being injured. A second series was forced over those first fixed." This gun was so made at Capt. Blakeley's suggestion. The method of rifling adopted by Capt. Blakeley cannot be made intelligible without a diagram; but it may be described as a series of grooves of very shallow depth, so arranged as to exert a maximum force in the direction of the rotation of the bullet with a minimum force in its radial or bursting direction. Capt. Blakeley exhibited in the court of the building in which the Section met, a 56-pounder, constructed on his own plans, from which he had thrown shells on Mr. Bashley Britton's system to a distance of 2,760 yards, with onl 5° of elevation, which was stated to be a range 200 yards greater than that of Sir W. Armstrong's 80-pounder.

Dr. Scoffern said, he thought Captain Blakeley had proved his point, that strength was the important desideratum. He said that a large number of Sir W. Armstrong's large guns had lately burst.

Mr. E. Cowper agreed with Capt. Blakeley. Sir W. Armstrong's guns that were said to have burst were simply cast-iron guns hooped. For small arms, he was of opinion that the Lancaster rifle was very successful. The bullet was of lead, and did not jam, as was sometimes the case with the iron shot in the larger guns. If Capt. Blakeley's plan were adopted, he thought that for £10 any gun in the service might be made sufficiently strong.

Mr. Dennis thought that Capt. Blakeley's method of giving strength was right.

A paper "on water meters" was then read by Mr. D. Chadwick.

"On suggestions for an electro-magnetic railway brake," by Dr. B. W. Richardson.

"Experiments to determine the effects of vibratory action and long-continued changes of load upon wrought-iron girders," by Mr. W. Fairbairn.

The paper was entirely of a technical character, and detailed the results of a set of experiments having for their object the determining matters with which the public are intimately concerned, viz., the efficacy of girders supporting bridges over which railway trains are constantly passing. It is well known that iron, whether in the shape of railway axles or girders, after undergoing for a length of time a continued vibratory or hammering action, assumes a different molecular structure, and though perfectly efficient in the first instance, becomes brittle and no longer capable of sustaining the loads to which it may be subjected. Mr. Fairbairn stated, that the practical conclusion to which his experiments, so far as they had at present gone, would lead was, that a railway girder bridge would, irrespective of other causes, last a hundred and fifty years.

A paper on "a novel means to lessen the frightful loss of life round our exposed coasts by rendering the element itself an inert barrier against the power of the sea; also a permanent deep-water harbour of refuge by artificial bars," by Admiral Taylor, was then read.

Mr. G. F. Train (of Boston, U.S.A.), then read a paper descriptive of "street railways as used in the United States," illustrated by a model of a tramway and car, or omnibus capable of conveying sixty persons.

In America such a car is drawn by a pair of horses. The tramway is laid in the centre of the street, and the rail is so shallow that it offers no obstruction whatever to carriages crossing it. In wide streets two such tracks are laid down, one for the going and the other for the returning traffic. He stated that in the cities in America the system was in constant use, and was now an absolute necessity there. He saw no difficulty in carrying out the system in our English towns or in London. Where there were inclines, an extra horse would be used, and where a street was not wide enough for two tracks he would put down a single track there, and bring the traffic back by a line laid in a parallel street. He had received a concession to bring out his system in Birkenhead, and he hoped by September to be able to show it in operation there. All he required was leave from the authorities in any town to lay down his trams and run his carriages.

"On the character and comparative value of gutta percha and India-rubber employed as insulators for subaqueous telegraphic wires," by Mr. S. W. Silver.

After pointing out some of the mistakes prevalent on the subject of the insulating properties of india-rubber, a comparison was made by the writer between the relative advantages and the insulating power of India-rubber and gutta-percha respectively. Insulation in the case of a submarine cable depends upon two causes or properties of the bodies used:—1. The specific non-conducting power of the substance; 2. Its impermeability, by which the original insulating conditions may be maintained. The insulating power of gutta percha is very high; but, in the case of a submarine telegraph cable its porosity renders it a very imperfect insulator in practice. India-rubber, with lower *specific* insulating properties (as would appear from experiments made in dry air), is, nevertheless, practically a far more efficient insulator, by reason of its complete impermeability, while in addition it possesses a lower inductive capacity. It was pointed out that impermeability is as important a question as specific non-conductibility in an insulator of such cables, and that even if a substance could be found insulating perfectly in dry air, it still might in practice be of questionable utility for submarine lines, owing to its porosity, as was the case with gutta percha. There was now no difficulty in covering wires with India-rubber.

"On an atmospheric washing machine," by Mr. J. Fisher.

Sums of Money were Granted for the following Purposes:—

	£	s.	d.
Kew Observatory Establishment,	500	0	0
Photoheliographic Observations at Kew,	90	0	0
Tyndall and Ball—Alpine Ascents,	10	0	0
Balloon Committee,	200	0	0
Brown and Committee—Dip,	30	0	0
Dr. Matheson—Chemical Alloys,	20	0	0
Prof. Sullivan—Solubility of Salts,	20	0	0
Prof. Voelcker—Constituents of Manures,	25	0	0
M. A. Gages—Chemistry of Rocks and Minerals,	20	0	0
R. Mallett, Esq.—Earthquake Observations,	25	0	0
Committee—Excavations at Dura Den,	20	0	0
J. G. Jeffreys and Committee—Ravages of Teredo and other Animals,	10	0	0
P. Sclater and a Committee—Report on Terrestrial Vertebrata of West Indies,	10	0	0
R M'Andrew and a Committee—For General Dredging,	25	0	0
Dr. Ogilvie and a Committee—Dredging the North and East Coast of Scotland,	25	0	0
Sir W. Jardine, Bart. and Mr. Sclater, for reprinting Rules of Zoological Nomenclature,	10	0	0
P. Sclater—Investigation of Apteryx,	50	0	0
Collingwood—Dredging in Mersey and Dee,	5	0	0
That Dr. Edward Smith, F.R.S., and Mr. Milner be a Committee for the purpose of prosecuting inquiries as to the effect of Prison Diet and Discipline upon the bodily Functions of Prisoners—with £20 at their disposal for the purpose,	20	0	0
Committee for exploring Uriconium	20	0	0
Prof. J. Thomson—Gauging of Water,	10	0	0
Committee on Steamship Performance,	150	0	0
That Prof. Philips be requested to complete and print, before the Manchester Meeting, a Classified Index to the Transactions of the Association, from 1831 to 1860 inclusive; that he be authorized to employ, during this period, an Assistant, and that the sum of £100 be placed at his disposal for the purpose,	100	0	0
	1,395	0	0

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

April 16, 1860.

"On preparing and mounting insects," by Mr. Hepworth.

Mr. Hepworth first destroys life by sulphuric ether, then washes the insects thoroughly in two or three waters in a wide necked bottle; he afterwards immerses them in caustic, potash, or Brandish's solution, and allows them to remain from one day to several weeks or months according to the opacity of the insect; with a camel-hair pencil in each hand, he then, in a saucer of clean water, presses out the contents of the abdomen and other soft parts dissolved in the potash, holding the head and thorax with one brush, and gently pressing the other with a rolling motion from the head to the extremities to expel the softened matter: a stroking motion would be liable to separate the head from the body. The author suggests a small pith or cork roller for this purpose. The potash must afterwards be completely washed away, or crystals may form. The insects must then be dried, the more delicate specimens being spread out or floated on to glass slides, covered with thin glass, and tied down with thread. When dry they must be immersed in rectified spirits of turpentine, and placed under the exhausted receiver of an air pump. When sufficiently saturated they will be ready for mounting in Canada balsam, but they may be retained for months in the turpentine without injury. Before mounting, as much turpentine must be drained and cleaned off the slide as possible, but the thin glass must not be removed, or air would be re-admitted. Balsam thinned with chloroform is then to be dropped on the slide so as to touch the cover, and it will be drawn under by capillary attraction. After pressing down the cover, the slide may be left to dry and to be finished off. If quicker drying be required, the slide may be warmed over a spirit lamp, but not made too hot, as boiling disarranges the object. Vapours of turpentine or chloroform may cause a few bubbles, which will subside when condensed by cooling.

Various specimens, beautifully mounted by this process by Mr. Hepworth, were exhibited.

Mr. Mosley read an account of a microscopical examination of flour, illustrative of the commercial advantages which may be occasionally derived from a knowledge of the use of the instrument.

Mr. Dancer exhibited diatomacea and foramanifera, obtained from deep soundings in the Atlantic and from the Red Sea.

Mr. Lynde exhibited pupa cases of insects from the Gold Coast of Africa.

Mr. Hepworth sent for inspection an ingenious diatom box, constructed for a friend going to travel on the continent.

April 26, 1860.

"Observations of the oblique belt on Jupiter," by Mr. Baxendell, F.R.A.S.

Since the publication of the lithographed sketches of Jupiter, taken by Mr. Long and myself on February 29, March 2, and March 5, showing the position and appearance of a curious oblique streak or belt on the disc of the planet, this streak or belt has increased greatly in size and darkness, and has become an object of considerable interest, as showing very strikingly the extent and rapidity of the changes which sometimes take place on the surface, or in the atmosphere, of this magnificent planet.

On March 7, the spot at the lower end of the oblique belt was perceptibly larger and darker than on the 5th, and was in the middle of its transit across the disc at 8h. 54m., Greenwich mean time. March 12, this spot was central at 8h. 1m.; the belt itself was darker and less inclined than before to the ordinary belts, and it was darkest on its lower edge. The lower part of the large dark belt was more nearly uniform in shade, and there was no decided appearance of dark spots in it.

March 14, 8h. 45m. I observed Jupiter with Mr. Worthington's 13-inch reflector, power 301. There was a faint, curved, dark mark extending across the bright equatorial belt from the upper end of the oblique belt to the small spot shown in the preceding part of the large dark belt in my sketch of March 5, and which, though now invisible with the 5-inch achromatic, is clearly made out with the large reflector. There were also traces of projections on the bright equatorial belt from two other points in the large dark belt. The spot at the lower end of the oblique belt was central at 9h. 41½m. Greenwich mean time

March 21. The oblique belt had increased considerably, and the spot at its lower end was much larger and appeared to consist of two spots in contact.

April 5. The following part of the oblique belt had undergone a considerable change, and had now three spots or rather large patches upon it much darker than the rest of the belt.

April 9. The oblique belt now extended over more than a semi-circumference of the planet, as it was seen at 8h., Greenwich mean time, extending completely across the disc. Its extremities were, however, still on the same parallels of latitude as when first observed by Mr. Long.

April 20. The precedinga end of the oblique belt was in it central position at 8h. 23m., Greenwich mean time. It was much darker than the rest of the belt, and was estimated to be two or three times darker than the darkest part of the large belt. Its colour was also very remarkable, being bluish black when contrasted with the dull yellowish red colour of the large dark belt.

From the observationa made this night, it appears that since Mr. Long first observed the oblique streak on February 29, it has gradually extended itself in a preceding direction, or in the direction of the planet's rotation, with a mean velocity of 3640 miles per day, or 151 miles per hour; its two extremities, nevertheless, remaining constantly on the same parallels of latitude.

"On the observations of the sun made by Hevelius in the years 1642–3," by Mr. Heelis, F.R.A.S.

May 25, 1860.

The following observations of the occultation of Jupiter by the moon, on the 24th instant, were communicated by Messrs. Worthington, Dancer, and Baxendell:—

Mr. Worthington observed with his Newtonian reflector of 13-inch aperture, power 81; Mr. Dancer with an achromatic reflector of 4-inch aperture, equatorially mounted in his observatory at Ardwick; and Mr. Baxendell with Mr. Worthington's achromatic equatorial of 5-inch aperture, power 68. The sky in the neighbourhood of the moon was covered with white cirrous haze, and all the observers remarked that the images of the moon and planet were very unsteady. No distortion of the image of the planet was noticed, but Messrs. Worthington and Baxendell remarked that at the disappearance of the planet the last point of light lingered for one and a-half or two seconds before its final extinction Mr. Baxendell also observed that during the passage of the dark limb of the moon over the planet, the light of the planet's disc was sensibly *brighter* close to the moon's limb than at any other part; but when the planet emerged at the moon's bright limb, that portion of its disc immediately adjoining the moon's limb was decidedly *darker* than the rest.

Mr. Baxendell reported that after April 20 the oblique belt on Jupiter increased in length at a rapidly increasing rate, and that on May 6 it was observed both by Mr. Long and himself to extend completely round the planet, the preceding end slightly overlapping the following as shown in Fig. 6, taken from a drawing made by Mr. Long. From February 29, the date of Mr. Long's first observation of the belt, to April 20, the average rate of increase had been 3640 miles per day; but from April 20 to May 6, the average rate had increased to 5460 miles per day, or 227·5 miles per hour!

June 20, 1860.

The Secretary read a few extracts from a private letter from Mr. Fremhly, of Gibraltar, in which he refers to the rotifera found in that neighbourhood; they vary very little from the British species described by Carpenter, Henfrey, &c. He found with them free vorticella with spiral stalk or tail, whilst in England the free vorticella is generally found without tail. Its utility in the case of those living with such neighbours is manifest, for the vorticella would now and again become involved in the eddy made by the cilia of the rotifera, but invariably before coming in contact did they succeed in escaping by the muscular power of the tail, which, by suddenly coiling, enabled them to throw themselves out of the influence of the current.

Mr. Frembly had found one of the algæ of the chlorosperma order, which was new to him, and of which he had not found any description. He intends to send specimens for examination.

A letter was read from Mr. Hepworth, of Crofts Bank, accompanying specimens of sarcina, injected kidney, spores of equisetum, Englina, batrachospermum monaliformis of two kinds, some diatoms, &c.

Mr. Samuel Hardman, of Davyhulme, presented a few well-mounted specimens of larva, wire-worm, willow cotton, cimex, and curculia.

Mr. Mosley exhibited the living (so-called) skeleton larva and pupa of the corethra plumicornis (Pritchard), pupa of Ephemera, marine gammarus from Gibraltar, and aquatic gammarus from near Northenden, almost identical with each other; the shell or scales of the marine animal being most transparent. A question was asked by Mr. Mosley, if any of the members had observed the effects of placing marine animals in fresh water; two of the gammari, born in sea water, were transferred to fresh water, and their liveliness, as exhibited after four days of the change, was as great as in their native element. Members were requested to acquire information on the subject, and communicate the same, as it is rather an important matter to owners of marine aquaria living at a distance from the sea.

Mr. Dancer sent for exhibition a species of topaz, with natural cavities containing fluid and gases, which, on boiling, present curious phenomena.

October 2, 1860.

The President, Dr. Joule, brought under the notice of the meeting a sheet of copper, upon which, whilst under magnetic influence, iron had been deposited electrolytically. The experiment was made by Mr. F. H. Hobler, of London, as follows:—

The plate of copper, forming the bottom of a shallow vessel filled with a saturated solution of sulphate of iron, was placed on the poles of a powerful horse-shoe magnet fixed vertically with its poles uppermost. An iron wire, dipping into the solution, was placed in connection with the positive electrode of a Daniell's cell, of one pint capacity the copper plate being connected with the negative electrone. The deposited iron exhibited the lines of magnetic force in the same manner as in the case of iron filings scattered on a sheet of paper placed over a magnet. When Mr. Hohler substituted a plate of tinned iron for the copper, he observed indications, though very faint ones, of the same phenomenon. On using a saturated solution of sulphate of copper, Mr. Hohler observed that the deposit was even throughout, and that no specific position of the axes of the crystals of copper could be detected, although they invariably formed on the outside of the two poles. Mr. Hobler, in discussing the phenomenon, inquires whether it is produced by the action of the magnet upon the solution in direction of the lines of force, or whether the iron is formed in the solution immediately above the copper plate, and then attracted by the magnet into the direction of the lines of force. The former suggestion appears to him to be inconsistent with our present knowledge of the influence of magnetism on chemical action; the latter, with the theory of electro-deposition, which supposes the coating to be formed on the plate and not *deposited*, strictly speaking, thereon.

The President exhibited a slip of paper which he had received from Professor Thomson. On the paper was printed by photography the line indicating the various changes of atmospheric electricity, which took place at the observatory of Kew during twelve successive hours. Much interest was excited by witnessing one of the first-fruits of Professor Thomson's beautiful instrument. The paper indicated a series of very rapid oscillations, about one per minute, of the intensity of atmospheric electrical force.

Mr. Henry Bowman presented a statement of observations on the temperature of the six summer months ending September 30th, 1860, taken by a self-registering thermometer at Victoria Park, Manchester:—

The maximum temperature in the 12 months was 78° on July 9th. The minimum temperature in the 12 months was 9·5 on December 19th.

Mr. Atkinson stated that during the months of June and August, he had observed the extraordinary rain-fall of 13 inches at Thelwell. The fall in July was not considerable.

Mr. Dyer having stated that on the morning of August 11th, a very loud explosion was heard in the neighbourhood of Blackfriars, London, the sky being clear at the time, a conversation took place on the subject of fire-balls and meteorites, in the course of which Mr. Ekman stated that during a most violent thunderstorm, passing over a tract of land intersected by a rapid stream, he had distinctly seen fire balls, the diameter of which he estimated at 2ft., projected from the clouds down into the water. The distance of the point where he stood, from the point at which the balls struck the water, could not have been more than 150 to 200 yards. The phenomenon was witnessed in Sweden many years ago.

On the Δ faced Polyacrons, in reference to the problem of the enumeration of polyhedra, by Mr. Arthur Cayley, F.R.S.

LONDON ASSOCIATION OF FOREMEN ENGINEERS.

September 4, 1860.

"On water, and some of the phenomena attending the generation of steam," by Mr. Stabler. He commenced by adverting to the known laws in relation to heat and evaporation, and travelling over much elementary ground, came finally to the causes of steam boiler explosions. These were enveloped in much mystery, and the theories in relation to them were for the most part inconclusive. Mr. Stabler leaned to the views of Mr. Jonah Colburn, as put forth in a recent pamphlet published by that gentleman, and in a discussion which followed the paper, Messrs. Briggs, Carpenter, Buckle, Warner, Chillingworth, the chairman, and others, advanced their respective views, which varied considerably.

MONTHLY NOTES.

MARINE MEMORANDA.

Another fine iron steamship, *Leinster*, for the Atlantic Mail Steam (the Galway) Company, has been launched from the building yard of Messrs. Palmer, Brothers, at Jarrow, on the Tyne. She is 378 ft. length over all, 360 ft. keel, 40 ft. beam, depth of hold 30 ft., 71 ft. 6 in. breadth over paddles, and 3000 tons register. She will be driven by three engines, oscillating, and by 800 nominal horse-power. She has eight boilers, with heating surface of 20,000 square feet, forty furnaces, fitted up with Beardsmore and Galloway's patent; has 650 berths, 567 for passengers. Her cabins are sumptuously fitted up, and she will be commanded by Mr. Prowse, lately Captain of the *Prince Albert*, and formerly chief officer of the *Great Eastern*. Iron shipbuilding is making rapid progress on the Tyne; two new yards have been recently opened out, and the others are well employed. Messrs. Palmer, Brothers, are just finishing a handsome paddle-wheel steamer, the *Southampton*, for the South Western Railway, to run between Southampton and Jersey. They are also making rapid progress with a steel-plated war steamer for the British Government, and have six other vessels on hand.

An action is about to be tried between an American patentee and the owners of the *Great Eastern*, for an infringement of a patent for the combination of the screw and paddles. The declaration alleges the issue of the patent in due form of law, its assignment to the plaintiffs, its value (which is placed at 100,000 dols.) The following extracts from the specifications will give a general idea of the scope of the patent:—"The nature of the first part of my invention consists in combining with the paddle-wheels, constructed in any desired manner, and placed at the sides of the vessel, a propeller, or propellers, placed at the stern of the vessel, the axis of which to be parallel (or nearly so) with the keel of the vessel, so that the vessel shall be impelled by the joint action of the propeller or propellers at the stern, and the paddle-wheels at the sides; such joint action having the effect, as shown by experiment, to impel the vessel with greater velocity and more steadily with a given force than by the action of the paddle-wheels or the propeller or propellers separately. . . . . And the second part of my invention consists in placing the paddle-wheels, when used in combination with the propeller or propellers at the stern, forward of the centre of gravity of the vessel, that a portion of the action of the paddle-wheels, thus placed, may have the effect to partly lift the bow of the vessel, while the propeller (or propellers) at the stern exerts all its action to impel the vessel forward." We are afraid it will be difficult to prove novelty on the patentee's side.

A Novel Yacht.—A large number of persons assembled at Exmouth last week to witness the launch of a yacht, designed by Mr. Peacock, of Starcross, and so constructed as to resemble a swan. The model of the vessel is Bewick's celebrated Mute Swan, and the size, four times that of the model, the length being 17 feet 6 inches; width, 7 feet 6 inches; height, 7 feet 3 inches; with the head 16 feet above the water line. The sails project on each side, in the shape of wings, and a novel mode of propulsion is adopted by using a pair of feet at the bottom of the vessel, which are constructed of steel and web, so contrived that in moving forward the foot contracts, but in moving backwards it expands; thus imitating the motion of a swan's foot, and propelling the vessel. Motion is given to these feet by means of a lever, worked like the handle of a fire engine. The yacht is provided with a cooking apparatus and a dining table. On removing the top of the table, ladies can fish through an opening in the bottom of the vessel. At the launch of this remarkable vessel the tide carried her down, and before she could be brought under control she struck upon a reef of rocks, which pierced her bottom; and it will therefore be necessary to re-dock and repair her before her extraordinary qualifications can be tested.

Iron-Plated Frigates.—A vessel of immense proportions, in the course of building in Messrs. Palmer Brothers' extensive works at Jarrow, is attracting a great deal of attention from persons passing up and down the Tyne in the packet boats between Shields and Newcastle. The vessel is the iron-plated ram-frigate, *Defiance*, building under contract for our Government. She is making most satisfactory progress, and is intended to carry 36 heavy Armstrong guns. Her iron casing will be 4½ inches thick on the outside. Next that will be 20 inches of timber, and inside of that the iron framing of the ship, which will be as strong as any already used for the largest sized vessels in the merchant service. Her deck-beams are made of Butterby's patent beam iron, and the decks to be laid thereon will be of iron. The vessel will have water-tight wing passages, with water-tight doors, so that in case a shot should be driven through the immense sides of the vessel men may pass through the doors into the compartment, and plug up the hole. Failing to do that, they can close the doors, and cut the chamber off from the other parts of the ship, keeping the water within it. The stern post of the ship will be one of the largest, possibly the largest, forging ever made in this or any other country. The stern of the vessel will also be of enormous strength, and will, in addition, be fortified with plating, so that the ship may run any timber-built ship down with impunity. With the exception of the ends, which have been kept back by the difficulty in forging such a mass of iron as that necessary for the stem and stern, the whole is plated. Many of the armour plates are on the premises, the feathering and grooving of these plates will be commenced at once.

Saline Strength of the Sea.—A new subject of research, which had hitherto been but cursorily touched upon, namely, the amount of salt contained in the sea under different latitudes—has just received a considerable degree of development through the labours of M. R. Thomassy, who, in the pursuit of his object, has crossed the Atlantic several times in all directions, thus performing a voyage of nearly 12,000 leagues. The determination of the degree to which sea water is impregnated with salt in different places is important, both because it exercises an influence over the existence and propagation of various marine species, and because it may furnish mariners with useful indications of certain contingencies worthy of attention. In northern latitudes, for instance, a diminution in the degree of saturation will warn the navigator of the breaking up of ice in the polar regions, or else it will inform him of the proximity of land. For his observations, M. Thomassy has employed the areometer of Beaume, the most convenient instrument of all, since it merely consists of a glass ball with a graduated tube attached to it, which, by sinking more or less in the liquid to be experimented on, denotes its degree of saturation. Assuming this instrument to be so graduated as to denote the liquid it displaces in sinking by thousandth parts to every tenth of a degree, M. Thomassy's experiments show that the salt contained in the water of the Atlantic, taken at the surface, and at a distance from islands, continents, and the ice of the polar regions, is represented by a minimum of 4 degrees, which, under the evaporating influence of the trade winds and a tropical sun, may rise to 4·40 degrees. At the mouths of rivers subject to the tides of the ocean, the areometer or halometer, as we may call it in the present instance, marks 3 degrees at high tide, the ebb making it fall at least one degree (the more the instrument sinks, the less is the salt contained in the water). Along the coasts subject to the influence of rivers, the instrument, according as there is flow or ebb, oscillates between 2·40 and 3·50 degrees, but may rise to 3·80 in southern latitudes. The Gulf stream marks 3·90.

The Trade on the Indus.—The trade upon the Indus is rapidly increasing, and only awaits proper facilities for transport to rise into important dimensions. The Oriental Inland Steam Company are briskly engaged in supplying the felt need of additional means of transport. Their steamer *Sutlej* has been successful in obtaining high prices for freight, which is in much demand, the new barges of the company lying in Kurrachee were about to be taken round to the river, by which additional accommodation would be afforded. The chief articles brought down the river appear to be wool, sugar, seeds, Cashmere shawls, and cloths, rugs, ghee, and saltpetre. Up the river the chief articles are bale goods of all kinds, beer and wines, haberdashery, china, cutlery, &c. There appears to be no doubt that the Indus will speedily become an important artery of commerce, and that Kurrachee, with the aid of river steamers will be the gate of Central Asia.

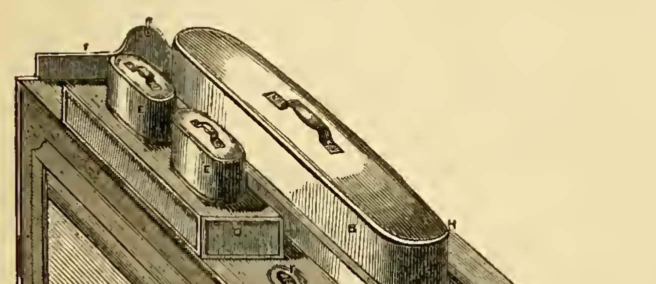
Death of Mr. Joseph Locke, M.P.—It is our painful duty to record the demise at Moffat, of the celebrated engineer, Joseph Locke, Esq., M.P. for Honiton. Mr. Locke had been in the habit for years of passing the shooting season in Annandale, and had been enjoying the sport in apparently his ordinary health for the last five weeks. On Monday the 17th ult., at an early hour, he rang for his servant, and despatched him at once for medical assistance, as he felt intense internal pain. Dr. James Munro and Dr. R. H. R. Hunter were speedily in attendance, and did all that skill and kindness could contrive to cure or sooth his distress. They were only partially successful, however, as the "Iliac passion"—the disease from which he suffered—is difficult and dangerous. He lingered in great pain till Tuesday at three minutes past 8 o'clock A.M., at which time he "passed away." At the hour of death, a nurse, his servant, and Dr. Munro were present. His nephew was speedily called. The Hon. H. Butler Johnstone, M.P. for Canterbury, and the Hon. J. T. Leslie Melville, of Roehampton, on being apprised of the event, took great trouble in advising, regarding, and assisting in the measures to be adopted for informing his relatives. Mr. Locke leaves a widow—who, we regret to say, is in very delicate health—but no family. He was president of the Institute of Civil Engineers, in succession to Mr. Robert Stephenson, and was a member of the Royal Society, and held the Cross of the Legion of Honour.

Cattle from America.—Mr. Caird stated at Gatehouse, a few days ago, that during his recent visit to the United States a proposal had been made to him to introduce from the prairies of America live cattle for the English markets. An American said to him :—"You have a great steamship, you have the *Great Eastern;* you can't fill her with anything; you can't put 10,000 men into her,—too many eggs in a basket are dangerous; you can't put an army into her, supposing you wanted to send an army abroad; no Minister of Great Britain would ever think of trying such an experiment. Well, then, since you can't find a cargo for her, you might carry in her an enormous quantity of fat cattle from America." It has been calculated that the *Great Eastern* would carry 4000 live cattle; and as she has no heaving, pitching motion, nothing almost but a gentle roll, these gentlemen believe that, with excellent ventilation, the animals could be put on board the steamer, and positively fattened while making the voyage, and that more comfortably and effectually than even in a feeding-house at home. That might be a chimerical idea. It had been calculated that, after carrying the 4000 head of cattle to the nearest seaport, and providing 500 tons of Indian corn, and 100 tons of water, for feeding them on board, there would still, at the current prices of meat, be an ample enough profit for those who should undertake what might appear at first sight to be a very daring speculation.

Scientific Jottings.—M. Spiquel, a chemist, gives the following recipe for silvering spoons and forks, of German silver, when somewhat the worse for wear:—Dissolve two grammes of nitrate of silver in forty grammes of distilled water; add six grammes of pure cyanide of potassium, which will immediately cause a precipitate of cyanide of silver looking like snow; but, on stirring with a glass tube, the liquid will immediately become limpid again. Dip a linen rag into this liquid, and rub the article to be silvered over with it; its surface will immediately be covered with a film of silver. Rinse in clean water, and wipe with a dry towel. M. Labiche, a chemist at Louviers, has found an easy way of discovering whether eggs are sound or not. He makes a solution of chloride of sodium (common salt), of a specific gravity represented by 1040 (water being 1000). If an egg, thrown into this solution, sinks to the bottom, it is fresh enough to be boiled in the shell; if it does not sink quite to the bottom, it is still fit to be eaten, but not under that form; and if it swims on the surface, it is decidedly spoilt. Professor Way has discovered an electric light far superior to any yet known. It is produced by the action of a voltaic battery on a moving column of mercury. The mercury is contained in a crystal globe of the size of an orange, and is sent from a very minute hole under the form of a thin metallic thread; it is received in a small cup, whence it falls into a basin below, to be again conveyed to the globe above. No sooner are the wires of the battery in contact with the thread of mercury than a vivid light is produced, which disappears as soon as the contact is interrupted. During this process, no evaporation of the mercury is observable.

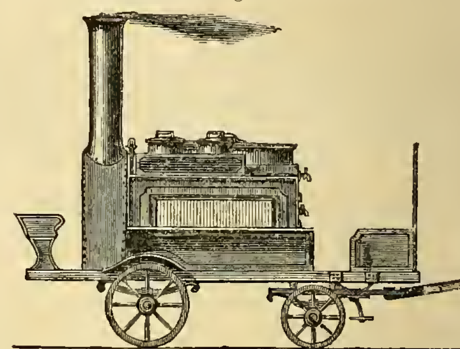
Portable Cooking Apparatus.—This apparatus is intended for the expeditions cooking and providing for an army, and is the invention of Messrs. William Prosser and John Hogg, of Wilton Park. The accompanying engravings, fig. 1, exhibits a front view of the apparatus; fig. 2, shows the same mounted upon wheels. A, is the main boiler, wherein may be cooked a sufficient

Fig, 1.



quantity of meat for any given number of men, from 100 to 1000 or upwards, depending on the size of the apparatus, and soup may be produced at the same time. The boiler is provided with an inner bottom or lifter, so that any weight of meat may be raised from it by means of a portable derrick and swing—arranged upon a platform for more easy distribution among the men. An improved steamer or colander, B, is placed upon the boiler, A, in which, from one cwt. to 5 cwt. of potatoes may be steamed at one operation, and which may be lifted at once from the apparatus and swung upon the platform for distribution. A convenient oven, C, constructed on the most approved principle, is arranged at the side of the boiler, A, and is adapted either for roasting meat, baking bread, or pastry. A steam chest, D, is so arranged as to steam any kind of vegetables, turnips, or cabbage; plum puddings, rice, fish, or any kind of food to which steam is applicable. Above the steam chest, D, are two smaller colanders, E, and at F, are apertures for receiving stew pans. A second boiler, G, is provided, in which coffee may be made in a few minutes for 100 to 1000 men or upwards, allowing each individual one pint for breakfast. A third boiler, H, is for the purpose of boiling water for making tea and to supply the other boilers when needed. I, is an improved damper for regulating the heat of the whole apparatus. The exceeding simplicity of the arrangements of the apparatus, and the perfect efficiency with which its operations are effected, shows at once the utility it is designed to accomplish. For instance, in four hours a whole army may be provided with boiled and roast meat, soup, frys, stews, vegetables of any or every description, pastry, plum puddings, rice, bread. The apparatus is such that it may be made to any size to cook with equal facility for a whole regiment as for a single company; and, moreover, it is constructed so as to be placed upon the most approved patent springs, axles, and wheels. A funnel, or smoke pipe, is attached to the apparatus upon the locomotive principle, and is adapted either for wood or coal or other dry fuel as emergency may suggest. A special advantage is obtained, during a campaign, when food may be cooked while marching, or during a single night's bivouac, without trouble or inconvenience, by merely adding the fuel, and the cooking at once proceeds. Fig. 2, represents the apparatus mounted on wheels; the sides of the carriage fall in half so as to form a platform for the cooks—a seat for one or more is fixed behind. The invention combines economy with cleanliness, efficiency, simplicity, and durability.

Fig. 2.



Four-Horse Mail Travelling between St. Louis and San Francisco.—The great overland route from St. Louis and Memphis, *via* El Paso, to San Francisco, which is now more used than any other of the continental routes. The mail service by it is semi-weekly during the travelling season; it is subsidised by the United States Government at 600,000 dols. per annum, and is the longest mail-coach road in existence, being, from St. Louis to San Francisco, 2765 miles in length. It is travelled night and day by four-horsed coaches, and with perfect regularity. The distance is accomplished in twenty-two days. The cost to a passenger is about £20, and £5 or so in addition, incurred for meals, which are incurred at regulated charges, and fixed stopping places along the road. Each passenger is allowed 50 lbs. of luggage, and can at any place he pleases await the next coach, of which he is three days in advance. For the first few days the process is found excessively fatiguing, but, after a little practice, the traveller sleeps regularly and soundly in the carriage, and finds enjoyment in the constant change and varied scenes experienced. This route is admirably provided with horses, mules, and coaches. Military stations have been established at regular intervals along the entire route; each station has a guard of twenty-five men well armed. This force is thought ample, considering the manner in which the buildings themselves, on a principle similar to that of the martello towers in Ireland, are constructed to resist effectually any number of hostile Indians at one time likely to collect in a single body. Each train of emigrants—who seldom use the coaches, but drive their own teams and carry their own penates—is guarded through the wilderness by twenty-five men, who take this duty in rotation, and are thus kept fully occupied. In this way the emigrant is provided with information as to halting-places, water, and provender for his cattle, fuel, &c., as he advances. The vehicles used upon the road from Fort Smith westward are of the description known as "celerity coaches." Built like a common coach, the body is hung on springs in the usual way; instead, however, of the heavy wooden top, with iron railing round, in common use, they are roofed with canvas, lightly supported, as in the case of a common waggon. This covering affords ample protection against the weather, while it greatly diminishes the weight of the vehicle and its liability to upset. The rolling stock on this line consists of one hundred of such coaches. The route, in some places, passes through long stretches of the great American desert, quite destitute of water; in one case there is seventy-five miles of barren sand. In these localities the stations are supplied by regular water trains, fitted up expressly for the purpose. The waggons used carry large tanks, which resemble the boilers of a steamboat, and, for sake of lightness, are made of block tin; each waggon is drawn by four mules. These teams convey water regularly to the different stations, where reservoirs are built to receive and preserve it for the use of passengers, and the employees and stock of the company contracting. This is, of course, a very expensive way to get water, but as every effort to procure it otherwise has failed, there is no alternative. Workshops and smithies are, of course, established at intervals along the road. It thus seems that mail-coaches on the most gigantic scale still exist.

Engine Room Telegraph.—The subjoined engravings represent an improved arrangement of engine room telegraph, introduced by Messrs. M. A. Soul & Co., of Leadenhall Street, London, engineers. Fig. 1 is a front elevation of the telegraph; fig. 2 is a back view of the same, with the cover removed; and fig. 3 is a vertical section of the same. The dial face is arranged with the signals in circular order, and in such a manner that the index is advancing when the vessel is required to be moved a-head, and when the ship is to be backed or moved astern, the index also moves in a backward direction. We may suppose, for example, that the engines are going full speed ahead, the attention of the engineer is directed to the telegraph by the sound of the alarm, he sees at a glance that the hand is moving in a retrograde direction, he knows at once that the speed has to be slackened, and he follows the signals indicated successively, with the starting lever or wheel, until the hand comes to a stop, and *vice versa*. The direction of action of the telegraph index is, therefore, always in accordance with the direction in which the engines are to be moved. At the back of the dial face, A, is a wheel, B, the periphery of which has on it a series of evolute cogs or projections. The

Fig. 1.

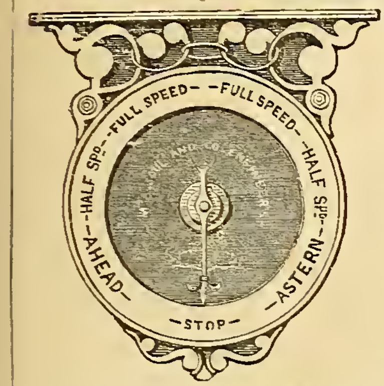


Fig. 2.

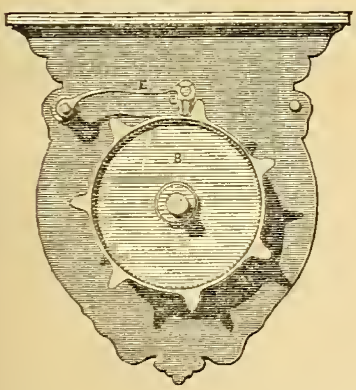
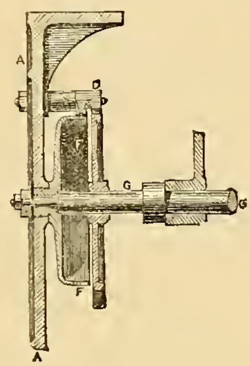


Fig. 3.



rotatory motion of the wheel, B, raises the hammer, D, which is attached to the blade spring, E, carried upon a stud fixed in the back of the dial face. The hammer, D, strikes on the bell, F, the centre of which forms a bearing for the end of the shaft, G. The motion of the handle on deck is transmitted to this shaft, to which the wheel, B, and index are fast, so that the motion of the index corresponds to the direction in which the operating handle is moved. The effective action as well as the simplicity of this telegraph will doubtless secure for it an extensive patronage.

The Trade of France.—It is evident, says M. Jules Dufour, of Lyons, in his evidence before the Conseil Superieur du Commerce, from the returns of trade, that France has nothing to fear from the most perfect freedom. Even with so many raw materials taxed and raised to an artificial value, she still competes successfully in the market of the world. She exports 400,000,000f. worth of silk manufactures, though she has to compete with all the world, including ourselves, who have every material duty free, besides other advantages. The reasonable inference is, how much more would France manufacture and export if it had silk at every stage, and all kinds of materials duty free? The manufacturers, however, still cry out for protection. St. Etienne, for example, produces 120,000,000f. worth of ribands, of which it exports 100,000,000f. It so happens, however, that there is a small return current in the shape of 8,000,000f. or 10,000,000f. worth of ribands from Coventry and continental markets. The people of St. Etienne fix their eyes on this, and not on the larger outward stream of their own manufactures, and cry for protection. Another instance M. Dufour gives in which protection has defeated itself, and led to a permanent injury, if, indeed, any interest can be injured by rivalry. When the Rhine and Switzerland formed a commercial union with the Empire, their manufacturers sent a great proportion of the silk to be dyed at Lyons. Not only was the trade actually there, but it was assumed that the waters of the Rhone, the Saone, and some other French rivers, were incomparable for dyeing. One of the results of the restoration was that the manufacturers of Lyons obtained a prohibition of the export of dyed silk, thus thinking to secure to themselves the best dyes, and the fabulous virtue of their rivers. The Swiss and Rhenish manufacturers had nothing to do but to set up dyeing establishments of their own, and to offer good wages; whereupon the cleverest chemists and workmen went off to their new employers; silk was found to be dyed just as well on the Rhine and in Switzealand as in France, and the foreign manufacturers were spared the delay, trouble, cost, damage, and risk incurred in the carriage of their silk to and fro.

The Manchester Association for the Prevention of Steam Boiler Explosions.—At the monthly meeting of the committee of management, Mr. H. W. Harman, chief inspector, presented his report, from which the following are extracts:—"We have made 172 visits, examined 501 boilers, and 296 engines. Of these, 7 visits have been special, 11 boilers specially, 16 internally, and 34 thoroughly examined; 6 cylinders have been indicated at ordinary visits, and 1 at a special visit. The general defects are as follows:—Fracture, 16 (3 dangerous); corrosion, 22 (3 dangerous); safety valves out of order, 13; water gauges out of order, 2; pressure gauges out of order, 4; feed apparatus out of order, 3; blow-off cocks out of order, 6; fusible plugs out of order, 2; furnaces out of shape, 8; blistered plates, 2; total, 78 (6 dangerous). Boilers without glass water gauges, 50; without pressure gauges, 8; without blow-off cocks, 11; without back pressure valves, 48. I have no observation to make this month on any particular defect, with the exception that I have noticed on several occasions water gauges fixed in dark situations, where it is impossible to observe their action with any degree of certainty. In all cases light should be thrown upon them by some means or other, as I believe it is far better to be without these and similar means of indicating the internal working of a boiler, than have them surrounded by circumstances calculated only to deceive. I may add, however, that I am glad to perceive a practice growing up of providing every boiler with two glass water gauges, thus affording at a cheap rate, even when the best description are adopted, additional security to all concerned. This, and the 'hooping round the internal flues' to prevent collapse, with other improved methods of construction, will, I hope, in future years have their effect in lessening the number of boiler casualties, not only in our own districts but all over the kingdom, by presenting a comparison with places where these points are not so attended to."

French Academy of Sciences.—At a recent sitting, M. Pouchet communicated some further experiments on the air of different localities. The author's object is to show that the atmosphere is far from being overloaded with microscopic spores and germs, as is asserted by those who deny his theory of spontaneous generation. In the experiments alluded to, the learned naturalist has explored the air of towns and marshes, the sea and mountains, with his aeroscope, an instrument, it will be remembered, of his invention, by which the particles contained in a given volume of air are blown on an adhesive surface. In towns, he has found that the air contains an infinite variety of organic remains and particles of things in common use. The air of marshes and plains is charged with a vast quantity of vegetable fragments. On the contrary, in the open sea, far from the shore, as also on the tops of mountains, above the cultivated and inhabited zones, particles foreign to the atmosphere become infinitely rare, and it is found not to contain either fecula or the eggs of infusoria, or the spores of mucedinæ. And yet, he states in conclusion, a single cubic decimetre of such air, taken in the open sea between Sardinia and Sicily, or in the midst of the Ionian Sea, or on the top of Mount Etna, has always furnished him with legions of ciliated infusoria, which, in his opinion, have been produced by spontaneous generation. M. Lemaire sent in a communication on the part played by infusoria and albumoid matter, in fermentation, germination, and fecundation. Having in a previous paper shown that saponined coal tar, as also phenic (carbolic) acid, will deprive mollusks, articulata, radiata, &c., of life, he now describes certain experiments made with a view to ascertain whether it is this deleterious quality which gives it the property of stopping and preventing fermentation. The question appears to be solved in the affirmative; and the author arrives at the conclusion that infusoria, so abundant in nature, are the *primum movens* of the phenomena of fermentation, germination, and fecundation.

M. Leverrier announced that, on the 15th of September, Mr. Ferguson had discovered another small planet in America. This new heavenly body, being different from those lately discovered by MM. Chacornac and Goldschmidt, is the 60th on the list. Dr. Jules Cloquet produced a pair of boots made of the tanned skin of a boa constrictor. The material is remarkably strong and supple; the scales have preserved their natural imbrication and colour, after the process of tanning, and the inside of the skin displays the marks of the scales in alternate reliefs and depressions. Dr. Cloquet, on this occasion, observed that it would be desirable to make further attempts to introduce the skins of the inferior vertebrata into trade, seeing that, as to thickness and durability, they decidedly offer greater advantages than those of the superior classes. He concluded by stating that he intended to give one of his specimens to the Museum of Natural History, the other to the cabinet of the Zoological Garden of Acclimatisation. M. Wothley, of Aix-la-Chapelle, sent in some specimens of a new process for enlarging photographs taken on collodion, either by solar or electric light. M. Wothley states that he arrives at these results by a series of manipulations constituting almost a new art. By means of a heliostat he directs a broad pencil of parallel rays upon the negative impression. The light, in passing through, forms a wide cone of diverging rays, which casts the enlarged image on a sheet of prepared paper. The impressions thus obtained may be of almost any dimensions; M. Wothley has produced some eight feet by five. The exposure to the light lasts about twenty-five minutes. For washing and fixing the impressions he employs various dexterous manipulations, rendered necessary by the large surface to be operated upon. M. Dehaut sent in a note stating that M. Foucalt (whose experiments on the pendulum, effected a few years ago at the Pantheon, are of European notoriety) is not the first discoverer of the fact that the plane of oscillation of the free pendulum is invariable; but that the honour of the discovery is due to Poinsinet de Sivry, who, in 1782, stated, in a note to his translation of *Pliny*, that a mariner's compass might be constructed without a magnet, by taking a pendulum and setting it in motion in a given direction; because, provided the motion were continually kept up, the pendulum would continue to oscillate in the same direction, no matter by how many points, or how often the ship might happen to change her course.

Preservation of Purity in Food.—Dr. Hassall, so well known for his labours in the cause of the prevention of adulterations in food, has recently published the following remarks on this most important subject. They are deserving of all consideration, as pointing out practical means for reducing an intolerable evil:—"The Adulteration of Food and Drink Bill having at length become law, it behoves manufacturers and traders to consider how best to secure themselves under its provisions. By the Act it is rendered illegal—1. To sell any article of food or drink with which, to the knowledge of the seller, any ingredient or material injurious to health has been mixed. 2. To sell as pure or unadulterated any article of food or drink which is adulterated or not pure. The punishment for the first offence consists in the infliction of a fine not exceeding £5, while for subsequent offences it is rendered lawful for the justices to cause the offender's name, place of abode, and offence, to be made public. It is clear, therefore, that the sale of adulterated articles of consumption, whether with or without the knowledge of the seller, should be carefully avoided. But how, it will be asked, is this object to be accomplished? It is necessary, in the first place, that manufacturers should take steps to ascertain that all articles sold or used by them are pure. This, inasmuch as most of their commodities are in the natural or raw state, it is not difficult in general to do, but, where a doubt exists, the manufacturer might secure himself by requiring from the vendor a guarantee of purity. The retailer, on his part, might protect himself by the observance of the following simple precautions:—Thus, he should never purchase manufactured articles below the prime cost of the constituent ingredients. He should require, in all cases, a guarantee of purity from the manufacturer, and, in order to fix the responsibility still more upon him, I would advise that the retailer should sell all manufactured articles in packages bearing upon them the name of the manufacturer. Further, I recommend that a warranty of purity be printed upon the wrapper of every parcel of manufactured goods sold. This warranty would give the public confidence, because it is not probable that any one would use it as a cover for adulteration, and there is no doubt but that all warranted articles would meet with a more ready sale than those not warranted. I see no objection to manufacturers and retailers supporting their own warranty by the testimony, in the form of certificates, of scientific persons of ability and reputation. If the precautions here suggested were observed, there would be but little fear of any proceedings being taken against any manufacturers or retail dealers under the provisions of the bill recently enacted for preventing the adulteration of articles of food and drink."

Honour to the Early Engineers.—The oldest engineer in the North of England, Mr. Jonathan Forster, died last week at Wylam, where he had laboured for upwards of half a century. He was engineer at Wylam Colliery when the experiments were made there which ended in the adoption of the locomotive engine, and though his name has never been brought prominently forward in connection therewith, there are those living who know that very many of the practical hints of which George Stephenson availed himself in improving the steam engine, came from Jonathan Forster.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded June 6.

1394. William M Cranston, King William Street, London Bridge—Improvements in reaping machines.—(Communication from Walter Abbott and William A. Wood, Hoosick Falls, Renesslair, U.S.)

Recorded June 27.

1559. Margaret J. L. Latta, Ashton, Gourock, Renfrewshire—Improvements in the treatment of various substances for the purpose of rendering the same non-inflammable.

Recorded July 10.

1663. Francois Boex, Bruxelles, Belgium—Improvements in ornamenting glass surfaces. (Communication from Pierre J. de Rudder and Jean Bonnetoy, Bruxelles.)

Recorded July 27.

1818. Carl Schön, Minden, Prussia—Improvements in the construction of propelling wheels for ships.

Recorded August 2.

1864. John Ryde, Queen Street, Cheapside—An improvement in apparatus applicable to turn-tables, swing bridges, cranes, and other machinery acting on a pivot.—(Communication from Frederic Paul, Rue Neuve St. Augustine, Paris.)

Recorded August 22.

2022. Francois R. Crumel Bridge Street, Blackfriars—Improvements in the albums of collection of photographic and lithographic proofs, engravings, and other drawings.

Recorded August 23.

2024. Joseph Corbett and Robert Smith, Elizabeth Terrace, Spencer Road, Hornsey New Town, Stoke Newington—An improved portable circular crane, applicable also as a fire escape.

2026. Richard J. Cole, Chepstow Villas West, Bayswater—Improvements in the construction of brushes.

2028. Samuel Purchas, Worcester—Improvements in the application of brakes to railway carriages.—(Communication from Albert Purchas, Melbourne, Victoria, Australia.)

Recorded August 24.

2035. William E. Gedge, Wellington Street, Strand—Improvements in turbinical hydraulic apparatus.—(Communication from Jean Larger, Felleringen, Haute Rhin, France.)

2042. James Fleming, jun., Newlands Fields, Renfrewshire—Improvements in washing, cleansing, and preparing textile fabrics and materials, and in the machinery or apparatus employed therein.

2043. Ferdinand P. J. V. Ouwelant, Paris—Improvements in apparatus to be applied to fire-places, for obtaining absorption of the smoke, and a better combustion of the fuel employed therein.

Recorded August 27.

2057. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Improvements in the construction of axle boxes and axle bearings.—(Communication from Augustin J. Cambon, Rosieres-sur-Mouzon, Vosges.

2068. John Bingley, Leeds, Yorkshire—Improvements in hydraulic presses, parts of which are also applicable to other purposes.

Recorded August 28.

2078. Michael J. Haines, Marlborough Street, Bristol—Improvements in the manufacture of driving straps.

2079. Caleb Kilner, George Kilner, William Kilner, and John Kilner, Thornhill, Lees, near Dewsbury, Yorkshire—Improvements in the manufacture of glass bottles, and the apparatus connected therewith.

Recorded August 29.

2080. Henry Chandler, Clements Inn Passage, and Amis Hempson, Southampton Buildings—Improved seats for theatres or other public buildings.

2081. Richard Vines, Great College Street, Camden Town, St. Pancras—Self-acting transverse floats for the propelling of steam vessels without any backwater.

2082. John Edwards, Aldermanbury, and Charles Iliffe, Birmingham, Warwickshire—Improvements in the manufacture of buttons.

2083. Charles Iliffe, Birmingham, Warwickshire—Improvements in the manufacture of metallic and non-metallic substances for expanding dresses, and other purposes.

2084. Joseph Wilson, Birmingham, Warwickshire—A new or improved warm bath.

2085. William H. Wain, Birmingham, Warwickshire, and William Instone, Wolverhampton, Staffordshire—A new or improved lamp.

2086. Edwarde Deane, Arthur Street East, London Bridge—Improvements in apparatus for facilitating culinary roasting.

2087. William E. Newton, Chancery Lane—Improvements in the manufacture of iron and steel.—(Communication from Ebenezer G. Pomeroy, New York U S.)

2088. Richard Perrott, jun., and John Malony, Cork—An improved mode of applying roasting jacks to kitchen ranges and cooking stoves.

2089. Sir Peter Fairbairn, Leeds, Yorkshire—Improvements in the construction of rollers used in machinery for preparing hemp and flax.

2090 Richard A. Brooman, Fleet Street—Improvements in apparatus for manufacturing embossed or figured fabrics in colours.—(Communication from Edme G. Bossuat, Paris.)

Recorded August 30.

2091. William Kirrage, and Abraham Ripley, Albion Place, Vauxhall, Surrey—The amalgamation of certain materials forming a plastic composition applicable to works of the fine arts, building purposes, imitations of marbles, ancient carvings, and various other uses.

2092. Hippolyte Mège, South Street, Finsbury—Improvements in making bread and ship-biscuit.

2093. Andre A. Beaumont, Rue Ste. Appoline, Paris, and South Street, Finsbury—An engine for raising liquids.

2094. Enoch Lockett, and Herbert Goodwin, Great Fenton, Stoke-upon-Trent, Staffordshire—Improvements in stacking earthenware during the process of firing, and in apparatus used for that purpose.

2095. George P. Dodge, St. Paul's Churchyard—Improvements in pumps and in apparatus for working the same.—(Communication from James M. Edney, Chambers Street, New York, U.S.)

2096. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in the manufacture of railway chairs.—(Communication from James H Sweet, Pittsburg, Pennsylvania. U.S.)

2097. Josiah Jones, Liverpool—Improvements in gun carriages.

2098 Charles J. B. Renault, Paris—Improvements in the manufacture of shirts and chemises.

2099. William E. Newton, Chancery Lane—Improvements in floating structures.—(Communication from Thomas Schofield, and Robert Schofield, Grass Valley, Nevada, California, U.S.)

2100. William S. Underhill, Newport, Salop—Improvements in the manufacture of iron fencing or lattice.

Recorded August 31.

2101. Charles Martin, Isleworth—Improvements in the form and in the method of and means for constructing beams, joists, girders, and rails, and in the permanent way of railways generally.

2102. George Richardson, Alma Park, Levenshulme, Manchester, Lancashire—An improved instrument to be used for ascertaining distances.

2103. Alexander S. Stocker, Clifton, Gloucester—Improvements in the manufacture of horse-shoes.

2104. Patrick M. Belton, New York City, U.S.—The manufacture of a compound to be used as a substitute for animal charcoal in refining sugar and otherwise.

2105. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in the treatment of zinc and other ores, and in the apparatus employed therein.—(Communication from Adrien Muller, and Alexander Lencauchez, Besancon, Paris.)

2106. William Gerrans, Tregony, Cornwall—Improvements in horse-rakes.

2107. Silas C. Salisbury, Essex Street, Westminster, and John F. Dickson, Nottingham—Improvements in sewing machines.

2108. William E Newton, Chancery Lane—An improvement in compositions for tanning skins and hides of all descriptions.—(Communication from C. L. Robinson and T. G. Eggleston, Fox Lake, Dodge County, Wisconsin, U.S.)

2109. William F Snowden, Chichester Place, Gray's Inn Road—Improved machinery for cutting chaff.

2110. William E. Newton, Chancery Lane—Improvements in air engines.—(Communication from John Ericsson, New York, U S)

2111. Jacob G. Willans, Clarence Place, Belfast—Improvements in the manufacture of iron and steel.

Recorded September 1.

2112. Frederic Allen, Seymour Place, Bryanstone Square—Improvements in a machine called a dumb jockey, used for the breaking and training of horses.

2113. Martin R. Pilon, Brussels, Belgium—Improvements in the manufacture and construction of fire-arms, and in the means of loading the same and controlling more effectually the action of the fire-lock.

2114. Ward Holroyd, and Samuel Smith, Halifax, Yorkshire—Improvements in looms for weaving.
2115. John C. Bowler, Bowden, Manchester, Lancashire — Improvements in obtaining motive power.
2116. Charles W. Harrison, Plumstead Common, Kent—Improvements in electric telegraphs.
2117. William Johnstone, and William Ross, Glasgow, Lanarkshire—Improvements in taps or valves.
2118. Stephen Hargreaves, Robert Holden, and James Nuttall, Haslingden, Lancashire—An improved warping machine.
2119. John Fisher, Leamington, Warwickshire, and Joseph Fisher, Dudley, Worcestershire—An improvement or improvements in oven grates and kitchen ranges.
2120. George Hollands, Rochester, Kent—Improved apparatus to be used in the process of fermentation.

Recorded September 3.

2121. William Forgie, and Thomas Finn, Nottingham—Improvements in the construction of apparatus for the preservation of life from drowning, and in the preparation of the material employed for this purpose, and for rendering articles buoyant in water.
2122. James E. Boyd, Hither Green, Lewisham, Kent—Improvements in machines used for cutting, scattering, and collecting vegetable and other substances.
2123. William H. Muntz, Millbrook, Hants—An improved apparatus for relieving the strain upon ships' cables.
2124. Henry Moore and Samuel Newberry, Burnley, Lancashire—Improvements in machinery for sizeing or dressing warps or yarns.
2125. Charles Mason, Basford, Nottingham—Improvements in apparatus for dressing lace.
2126. George E. Donisthorpe, Leeds—Improvements in sizeing yarn or thread previous to warping.
2127. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in the manufacture of moulds and cores for the casting of cylindrical articles, and in the machinery or apparatus employed therein.—(Communication from Homer Parmellee, Philadelphia, Pennsylvania, U.S.)
2128. Thomas Grimston, Clifford, Yorkshire—Improvements in machinery for balling threads, yarns, or twines, made from fibrous materials.

Recorded September 4.

2129. William H. Delamare, Clarence Place, Hackney Road—An improved machine for cleansing and peeling grain and seeds.
2130. James J. Stevens, Darlington Works, Southwark, Surrey—Improvements in iron beldsteads.—(Communication from George H. Faulkner, Madras.)
2131. John Hughes, William Williams, and George Leyshon, Brockmoor Works, Brierly Hill, Staffordshire—Improvements in the manufacture of tin and terne plates, and in apparatus employed therein.
2132. Henry J. Standly, Pall Mall East, Westminster—Improvements in the production of gas for illumination and other purposes, and the utilisation of the products arising therefrom.
2133. George P. Wheeler, Abinghall, near Mitcheldean, Gloucester—An improved mode of and apparatus for preparing half-stuff for paper makers.
2134. George P. Wheeler, Abinghall, Micheldean, Gloucestershire—An improved mode of and apparatus for, preparing bleaching agents.
2135. Anthony Southby, Bulford, Wilts—Improvements in the manufacture of paper.

Recorded September 5.

2136. Harrold Potter, and Alfred Peck, Manchester, Lancashire — Improvements in treating or preparing textile materials and fabrics.
2137. Sigismund Schuhman, Burnley, Lancashire—Improvements in looms and in the means of driving the same.
2138. David Y. Stewart, Glasgow, Lanarkshire—Improvements in moulds for casting.
2139. Ernest Vanville, Rue de Bondy, Paris—A system of extracting juice from beetroot, and other plants.
2140. William E. Gedge, Wellington Street, Strand—Improved cylinders for laminating metals.—(Communication from Eugène L. Robert, Rue de Bondy, Paris.)
2141. John Cooper, Bilston—Improvements in railways, railway carriages, and apparatus connected therewith.
2142. Frederick Ransome, Ipswich—Improvements in preserving stone, bricks, and other porous building materials, and in cementing porous and other matters in manufacturing blocks, and other articles thereof.
2143. William E. Newton, Chancery Lane—An improvement in belt shippers.—(Communication from John C. Goar, Monterey, California, U.S.)
2144. George Bedson, Manchester, Lancashire—Improvements in annealing, cleaning, and galvanising, or otherwise coating wire and sheets or strips of metal with metals.
2145. Maurice Vergnes, New York, U.S. — An improvement in the construction of magnetic or electric helices.
2146. George F. Wilson, Belmont, Vauxhall, and John Jackson, York Street, Bromborough Pool, Birkenhead—Improvements in lamps and lamp wicks.
2147. Walter R. Knipple, Limehouse—An improvement in water-closets, and in flushing tanks or apparatuses.
2148. John Huggett, Eastbourne, Sussex—A method of and apparatus for regulating the light in street and other lamps, whereby the relighting and extinguishing of the same may be dispensed with.

Recorded September 6.

2149. Josephus Walker, Bradford, Yorkshire—Improvements in self-acting temples.
2151. John Davis, Manchester, Lancashire—An improved application of material to the manufacture of coupling apparatus to be employed in connecting locomotive engines, tenders, and carriages, together upon railways.
2152. William H. Burke, elder, and William H. Burke, younger, Brompton—A method of preparing fabrics composed of or containing caoutchouc, to enable them to resist the action of colours and varnishes containing oil.
2153. Richard Wright, Grosvenor Street, Camberwell, Surrey—Improvements in the manufacture and refining of sugar, and in apparatus employed therein.
2154. William E Newton, Chancery Lane—Improvements in the manufacture of archil.—(Communication from Mr. Jean F. Beyerbach, Frankfort-on-the-Maine.)
2155. Benjamin Oldfield, Coventry Warwickshire—Improvement in looms.
2156. Aaron Lester, Coventry, Warwickshire—An improvement in looms for weaving.
2157. George Herring, Albert Terrace, Hatcham Park, and David Lichtenstadt, Peckham, Surrey—Improvements in treating a certain substance to obtain textile fibres and materials for paper making, and charcoal for gunpowder, pyrotechnic, and other purposes.

Recorded September 7.

2158. Benjamin Nicoll, Regent Street—An improved method of treating needles, and needles used in sewing and other machines, applicable also to those parts of such machines that hold the needles.
2159. Augustus D. Lacy, Hall House, Knayton, Yorkshire, and William C. Homersham, Adelphi Terrace—Improvements in machinery and implements for ploughing and cultivating land.
2160. Joseph S. Travis, Stretford, Manchester—Improvements in traction engines.
2161. Charles Stevens, Welbeck Street, Cavendish Square—An improved method of preserving various alimentary substances.—(Communication from Madame L. Fauve, Rue Laffite, Paris.)
2162. Charles Stevens, Welbeck Street, Cavendish Square—An improved impermeable oil varnish.—(Communication from Antonie Bouett, Rue Laffite Paris.)
2163. Charles Stevens, Welbeck Street, Cavendish Square—Improved bags to be used in the manufacture of sugar.—(Communication from Edouard Fourmeaux, Rue Laffite, Paris.)
2164. Charles Stevens, Welbeck Street, Cavendish Square—An improved lavatory.—(Communication from Flury Jourjon, Rue Laffite, Paris.)
2165. Charles Cowper, Southampton Buildings, Chancery Lane—Improvements in the manufacture of cast steel, and in the re-manufacture of old steel.—(Communication from Louis J. D. H. C. C. de Ruolz, and Anselme L. M. de Fontenay, Paris.
2166. John Hamilton, jun., Liverpool—Improvements in sockets for receiving the lower parts of the posts or uprights employed in constructing electric telegraphs.
2167. Paul Elias Aubertin, Great Winchester Street—Improvements in the manufacture of soap.—(Communication from Jules G. Gross, Mulhouse, France.)
2168. James H. S. Wildsmith, Wolverhampton, Staffordshire—A new or improved lubricating material or compound, which said material or compound may also be employed for the manufacture of soap.
2169. James Spratt, Camden Road Villas, Camden Town—Improvements in electrical conductors and their fittings.
2170. Edward Deane, Arthur Street East, London Bridge—An improved rotary cooking apparatus.

Recorded September 8.

2171. Elias Weiskopf, Claremont Square—Improvements in the manufacture of certain kinds of artificial combustible for lighting of wood and coal.
2172. Deane J. Hoare, Albemarle Street, Piccadilly—Improvements in locks.
2173. Peter R. Cross, Sudbury, Suffolk—Improvements in means or apparatus to give protection to the mouth and nostrils in respiration, and to the throat and chest against the injurious effects of atmospheric influences.
2174. Frederic Yates, Parliament Street—Improvements in apparatus for and in the mode of manufacturing iron, steel, and other metals and substances, gaseous and solid, fuel being thereto applied as the heating, reducing, cementing, and oxidising agents.
2175. Enoch Horton, Darlaston, Staffordshire—New or improved machinery to be used in the manufacture of bolts, nuts, and screws.
2176. Armand L. A. Herbelot, Paris—An improved method of manufacturing paper from wood.
2177. William E. Gedge, Wellington Street, Strand—Improved means of extinguishing conflagrations.—(Communication from Alexandre Lelandais, Nantes, Loire, Inferieure, France.)
2178. Jean B. F. Duverge, Bordeaux, Gironde, France—Improved machinery or apparatus for horizontal, vertical, or inclined boring.
2179. Joseph Fourdrinier, Grove Terrace, New Peckham, Surrey—Improvements in kilns for drying grain, seeds, and other agricultural produce.
2180. James Wood, West Smithfield—Improvemements in sterotyping apparatus.
2181. John J. C. Kleinfelder, Paris, and Charles Girardet, Vienna, Austria—Improvements in carriages and harness for horses, and in the means of attaching harness to carriages.
2182. Geminiano Zanni, Upper King Street, Holborn—Improvements in apparatus for roasting.

Recorded September 10.

2183. Francois J. Cantagrel, Rue Buffault, Paris—Apparatus for ascertaining the existence of escapes in pipes and vessels for conveying (and holding) lighting and heating gases, which apparatus he denominates "escape-indicator."
2184. Thomas Thornton, Edwin Thornton, and Joseph Thornton, Elland, Yorkshire—Improvements in looms for weaving.
2185. William E. Robson, Adam's Court, Old Broad Street—The application of an improved elastic material for springs or cushions on the chairs of railways and tram roads, or in any other position, to prevent the friction caused by the working of iron on iron or other metal substances.
2186. William Wilkinson and Henry T. Wright, Boston, Lincolnshire—Improvements in apparatus used when stacking straw and other agricultural produce.
2187. Thomas Turpie, North Shields—Improvements in furling sails.

Recorded September 11.

2188. Henry C. Hill, Stalybridge, Cheshire—Improvements in the construction of stays for steam boilers.
2189. James Greenwood, Halifax, Yorkshire—Improvements in looms for weaving.
2191. Donald Nicoll, Regent Street — An improved over-coat, particularly adapted to military purposes, to be called "Nicoll's Lacerna."
2192. Marc A. F. Mennons, Ru de l'Echiquier, Paris—An improved apparatus for sealing letters and other documents.—(Communication from L. M. H. Fromout, Paris.)
2193. Robert C. Clapham, Walker, Northumberland—Improvements in the manufacture of bleaching powder, and apparatus employed therein.
2194. Jean Denechaud and Joseph Chapa, Bordeaux, France—An electric controller for indicating the relative position of trains on railways.
2195. David Peacock, Walpole Street, New Cross, Kent, and Thomas R. Truman, Edwin Place, Peckham, Surrey—Improvements in the construction of wheels for traction and locomotive engines.
2196. Thomas Boyle, York Street, Belfast, Antrim—Improvements in preparing machinery for flax and other fibrous substances.
2197. Ebenezer Clemo, Toronto, Canada—An improved mode of manufacturing stock for paper from straw, and other vegetable substances.

Recorded September 12.

2199. J. C. de Louvrié, Boulevard Beaumarchais, Paris—Improvements in moulding without models.
2201. William Massey, Linacre Marsh, Liverpool, Lancashire—Improvements in the manufacture of artificial mineral teeth, and the means whereby the same may be more securely attached to artificial gums and palates, formed of vulcanite or other similar materials.

2202. Frederic A. N. Freppel, Paris—An improved preservative and sizeing compound, for sizeing cotton, wool, linen, or other yarns, for weaving and for dressing textile fabrics.
2203. Robert H. C. Wilson, Wilson Street, Gray's Inn Road—Improvements in registering thermometers.
2204. John Petrie, jun., Rochdale, Lancashire—Improvements in cocks or taps for liquids.
2205. Robert H. Gratrix, Salford, Lancashire, and Matthias P. Javal, Thann, France—Improvements in dyeing and printing textile materials and fabrics.

Recorded September 13.

2207. James Wright, Bridge Street, Blackfriars—Improvements in the construction of safety or Davy lamps.—(Communication from Mr. Laurent Lermusiaux, Paris.)
2209. Nathan Thompson, jun., Abbey Gardens, St. John's Wood—Improvements in boat building, and in apparatus used therein.
2211. George Price, Wolverhampton, Staffordshire—An improvement in the manufacture of wrought-iron drill-proof safes.
2212. Joseph Chesterton, Leicester—A new or improved method of constructing portable buildings.
2213. Edward Field, Carlisle Street, Soho Square—A covering for the moustache or hairy parts of the face.
2214. Frederick M. Murton, and Jonathan Millington, Strood, Kent—Improvements in throttle and expansion valves for engines worked by steam or other vapour, or by liquids or gases.
2215. Wallace C. Sommerville Upper Albany Street, Regent's Park—Improvements in apparatus for supplying locomotive tenders with water.
2216. George Davies, Serle Street, Lincoln's Inn—Improvements in the processes of cementing or case-hardening and softening iron.—(Communication from Jules Cazanave, Paris.
2217. Nicolas Rosinsky, St. Petersburg, Russia—A new kind of oil for cosmetics, soaps, and other like articles for the toilet.

Recorded September 14.

2218. Francis A. Calvert, Manchester, Lancashire—Improvements in steam engines and boilers, and in valves for steam and other fluids.
2219. Ferdinand Scheithauer, Vienna, Austria—An improved machine for printng calico and other fabrics.
2221. James Cooke, Manchester, Lancashire—Improvements in singeing, treating, or finishing textile fabrics, yarns, felts, and other similar materials.
2222. John Burrel, Norwich, Norfolk—Improvements in the manufacture of woven materials applicable as crinoline and other articles of ladies' dress.
2223. Adam Burdess, Spon Street, Coventry, Warwickshire—Improvements in railway brakes.
2224. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire —Improvements in apparatus for raising or lowering and weighing heavy bodies. —(Communication from Louis Vernay, Paris.)
2225. James Petrie, Rochdale, Lancashire—Improvements in steam boilers.
2226. Luke Turner, Leicester—Improvements in the manufacture of elastic fabrics.
2227. Thomas Till, Birmingham, Warwickshire—Certain improvements in machinery for making nails applicable in particular to the making of that description of nails called "horse nails."
2229. Pierre A. Beddat, Place Imperiale, Lyons, France—A new propeller.
2231. William E. Gedge, Wellington Street Strand—Apparatus for goffering felt or cloth hats or other analogous articles.—(Communication from Francois Munier, fils., Quillan, Aube, France.
2232. William E Gedge, Wellington Street, Strand—Improvements in ornamenting glass with coloured designs or pictures in imitation of stained or painted glass.—(Communication from Jules Beneche, Elbeuf, Seine Inferieure, France.
2233. Robert Mushet, Coleford, Gloucestershire—An improvement or improvements in the manufacture of cast steel.
2235. Michael Henry, Fleet Street—The employment of a certain sorting process for silk, and other fibrous materials, and an apparatus for the purpose of performing the same.—(Communication from Pierre R. Huguet, Boulevard, St. Martin, Paris.)

Recorded September 15.

2236. William Schnell, Strand—Improvements in the manufacture of lucifer matches.
2237. David Davis, and James Allen, Manchester, Lancashire—Improvements in apparatus for preventing the explosion of steam boilers.
2239. George J. Wainwright, and Charles T. Bradbury, Dunkinfield, Cheshire—Improvements in the manufacture of damasks and other similar fancy goods.
2240. Michael Burke, Gilbert Street, Liverpool, Lancashire—An improved spring sacking or foundation for a bed matress or other like article, especially adapted for ships' use, barracks, hospitals, and military camps, applicable also for domestic dwellings.
2241. George Davies, Serle Street, Lincoln's Inn—Improvements in lamps for burning coal oil and other like combustible fluids, part of which improvements is applicable to gas fittings.—(Communication from J. T. V. Kirk, Philadelphia, U.S.)
2242. George F. Bradbury, Oldham, Lancashire, and Joseph J. King, Glasgow, Lanarkshire —Improvements in binding and folding guides in sewing machines.
2243. James Horsey, Belvedere Road, Surrey—Improvements in India-rubber teats.
2244. Frederic Seiler, Paris—Improvements in compressing air or other gas which may be transferred by tubes for raising water, and for various other purposes.
2245. William Rumbold, St. Louis, Missouri, U.S.—An improved mode of constructing domes.
2246. William E. Gedge, Wellington Street—Improvements in the manufacture of manure. —(Communication from Emile Avice, Orleans, France.)
2247. James M. Napier, York Road, Lambeth—Improvements in machinery for the manufacture of sugar.
2248. Thomas Barnett, Oldham, Lancashire—Improvements in high-pressure steam engines.
2249. Stephen Barnwell, and Alexander Rollason, Coventry, Warwickshire—Improvements in combining and mixing certain solutions of pyroxylene with animal, mineral, and vegetable substances, by which its quality is altered in such manner as to produce hard, resistent, adhesive, plastic, or resilient compounds, and articles unalterable in their nature and varied in colour, which said compounds, in a state of solution, may also be advantageously employed as paints or varnish.
2350. William E. Newton, Chancery Lane—Improvements in safety locks.—(Communication from Edouard L. Poirier, Paris.)
2251. Alfred V. Newton, Chancery Lane—An improvement in the construction of brooms. —(Communication from William H. Towers, New York, U.S.)

Recorded September 17.

2252. Charles Stevens, Welbeck Street, Cavendish Square—A new medicochirurgical bleeding instrument.—(Communication from Badouin and Guerin de Tenein, Paris.)
2253. James Hansor, Portland Place, Wandsworth Road, Lambeth, Surrey—Improvements in the manufacture of coal-gas.
2254. Joseph E. Betts, Northampton—An improved machine for cutting out clothing.
2255. John H. Walsh, Kensington—Improvements in breech-loading fire-arms
2256. Francis Zysel, Great Pearl Street, Shoreditch—Improvements in the construction, of studs or fastenings for shirt-fronts and other articles of dress.
2258. William H. Teulon, Cooper's Row, Tower Hill—Improvements in brewing, and in apparatus employed therein.—(Communication from Anton C. L. Reinhardt Mannheim.)
2260. William E. Newton, Chancery Lane—Improvements in lanterns.—(Communication from Nathaniel Tufts, jun., Boston, Augustus Tufts, Malden, Middlesex, Massachusetts, and Simon G. Cheever, Boston, U.S.)
2261. William E. Newton Chancery Lane—Improvements in the manufacture of files.—(Communication from William P. Pierce, Boston, Massachusetts, U.S.)
2262. George Grout, Wood Green, Tottenham—Improved machinery for manufacturing elastic cord.
2263. Robert Crawford, Beith, Ayrshire—Improvements in machinery or apparatus for weaving figured or plain fabrics.

Recorded September 18.

2264. Horatio Stead and Henry Gledhill, Halifax, Yorkshire—Improvements in finishing textile fabrics, and in the means or apparatus employed therein.
2265. Charles Golden, Bradford, Yorkshire—Improvements in breech-loading fire-arms and in projectiles
2267. John Strathearn, Glasgow, Lanarkshire—Improvements in preparing cotton and other fibrous materials for spinning.
2269. William E. Newton, Chancery Lane—Improvements in gas meters.—(Communication from Nathaniel Tufts, jun., Boston, Augustus Tufts, Malden, Middlesex, and Simon G. Cheever, Boston, Massachusetts, U.S.)
2270. Daniel Miller, Glasgow, Lanarkshire—Improvements in the mode of constructing breakwaters, piers, quays, sea walls, and the submarine works of fortifications.
2271. Griffith Owen, Boston Lodge, Merioneth—Improvements in the construction of sawing machines.
2273. Richard J. Cole, Pembridge Gardens, Bayswater—Ornamenting the external walls of houses and buildings.

Recorded September 19.

2274. William Holgate, Burnley, Lancashire—An improved beaming frame.
2275. Edmund Hunt, Glasgow, Lanarkshire—Improved apparatus for preparing saws.—(Communication from Theodor A. Prale, Hamburgh.)
2276. Francis A. Calvert, Manchester, Lancashire—Improvements in machinery and apparatus for opening, burring, cleaning, and carding cotton, and other fibrous materials, part of which is applicable to opening twisted yarns and woven fabrics.
2277. Richard J. Cole, Pembridge Gardens, Bayswater—Improvements in the manufacture of brushes.
2279. Emile Martin, Rue d'Antin, Lille, and Theodor Gudin, Rue Balzac, Paris—Improvements in apparatus for manufacturing gas when dissolving zinc or iron in dilute sulphuric or other acid.
2280. Maurice Sauttet, Boulevart Montmartre, Paris—Improvements in generating and applying steam as a motive power, and in apparatus employed for these purposes. —(Communication from Joseph Gill, Marsala, Sicily.)
2281. Friedrich W. J. Zorn, London Wall—Improved apparatus for charging and closing the ends of cartridges.—(Communication from Henry Genhardt, Liege, Belgium.)
2282. Thomas Greenwood, Leeds, Yorkshire—An improved mode of and apparatus for manufacturing files.
2283. Maximilian Simon, Little Moorfields—An improvement in sewing machines.

Recorded September 20.

2285 Alexander W. Williamson, University College, and Loftus Perkins, Francis Street, Gray's Inn Road—Improvements in surface condensers.
2287. Thomas Briggs, Salford, Lancashire—Certain improvements in the manufacture of oil-cloth or oil-paper, to be employed for packing purposes, or for coating or covering surfaces, and in apparatus connected therewith.
2289. John H. Taylor, Lee Terrace, Blackheath, Kent—Improved apparatus for lowering ships' boats, and disengaging same from the tackles.
2291. Richard A. Brooman, Fleet Street—Improvements in machinery for printing shawls and other fabrics.—(Communication from Ignace M. Firnstahl, Vienna.)
2293. George Arnold, and George Arnold, jun., Penton Place, Kennington, Surrey—Improvements in elastic skirts for distending ladies' dresses.
2295. Theophilus Westhorp, Manor House, Poplar—Improvements in the manufacture of oakum.

Recorded September 21.

2299. Thomas Richardson, Newcastle-upon-Tyne—Improvements in the treatment of bones, and in the manufacture of paper.
2305. Thomas Martin, Manchester, Lancashire—An improved method of connecting and disconnecting pipes or tubes.
2307. James Campbell, Adelaide Road, Haverstock Hill—A chambered floating dry dock.
2309. Alfred V. Newton, Chancery Lane—An improved mode of producing relief-printing plates, blocks, and cylinders.—(Communication from De Witt C. Hitchcock, Edwin B. Larchar, Edwin M. Larchar, James S. Talbot, and William S. Tisdale, U.S.)

Recorded September 22.

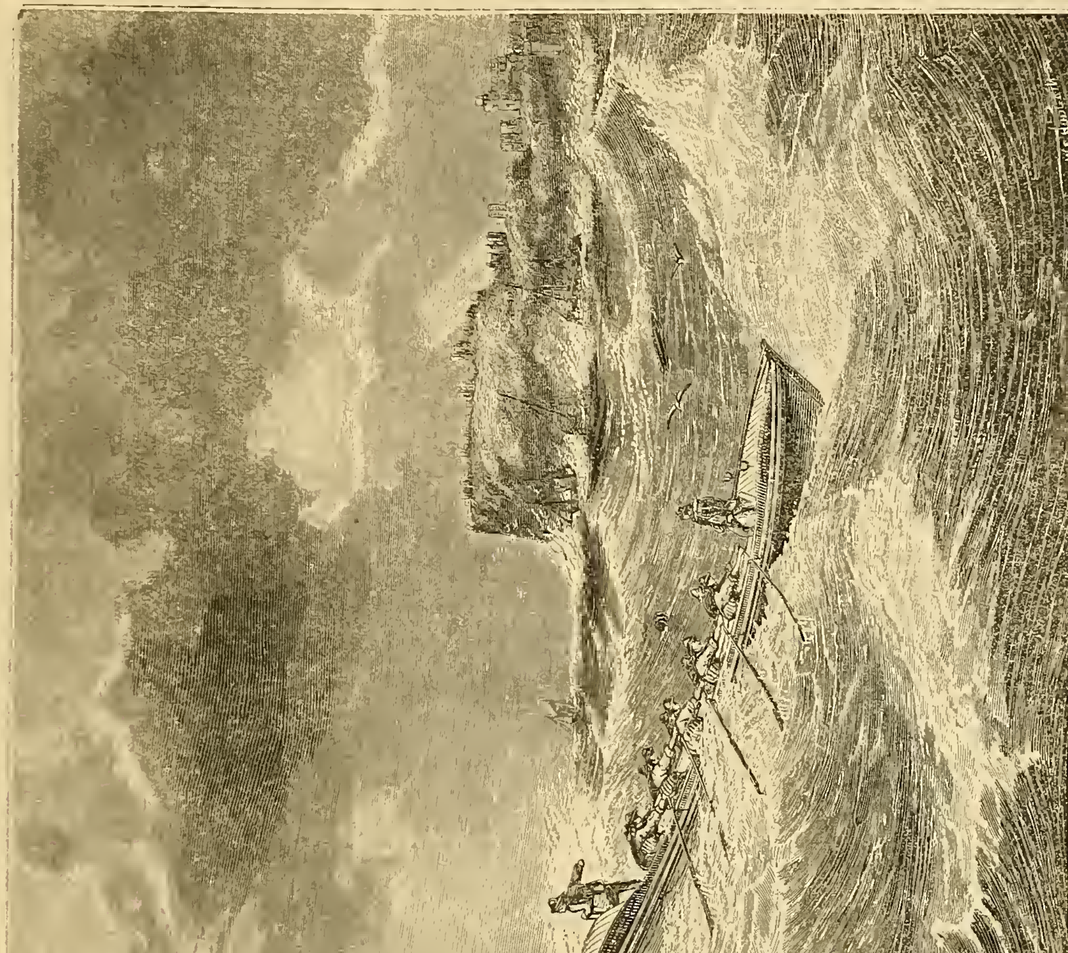
2311. John H. Well, Brooklyn, Kings, New York U.S.—Improvements in rocking chairs.
2313. Thomas Griffiths, Birmingham, Warwickshire—A new or improved pulley for window and other blinds.
2315. John J. Rowley, Rowthorne, near Chesterfield, Derbyshire Improvements in machinery for cutting or clipping hedges.
2317. John L. Budden, Fenchurch Street—Improvements in the application of steam or highly rarefied gas, or other aeriform fluid to obtain motive power for propelling and other purposes.—(Communication from Woodford Pilkington, Cape of Good Hope.)

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 15th to 22d September, 1860.

Sept.	15,	4,291	Messrs. Wilkinson and Son, 27 Pall Mall, S.W.—"Lever Fore end for fire-arms."
	22,	4,292	Maudslay and Son, Liverpool—"Improved pneumatic inkstand."

LIFE-BOAT SERVICES.



ONE OF THE LIFE-BOATS OF THE ROYAL NATIONAL LIFE BOAT INSTITUTION PROCEEDING OFF TO A WRECK.

We have often called attention in the *Practical Mechanic's Journal* to the lamentable loss of life from shipwrecks on the coasts and in the seas of the British Isles during the past year. In that period 1416 wrecks occurred, with the loss of 1646 poor creatures. The money value of the property destroyed from the wrecks is represented at about two millions sterling, but who can represent the misery in many a home throughout these islands resulting from them? Can nothing be done to lessen this fearful loss of life and destruction of property? Do we use all tbe aids of science in this truly important and national affair? Might not much be accomplished to mitigate this fearful loss by the construction of "harbours of refuge" in suitable localities? Surely it would be a wise and prudential arrangement for us to provide harbours on some of our most exposed points on the East Coast and elsewhere. Because we have blundered at Portland and other places, it is contended that we have no encouragement to pursue any additional outlays on similar works. So we continue to throw away lives by thousands and money by millions. These extensive undertakings have failed in the hands of Government, which is never successful in the art of mechanical construction. If these important works were entrusted to the practical intellects of men who really uuderstand them, we should not have to lament year after year that no real progress has been made with them.

Meanwhile, whatever can be done by the establishment of life-boats, and afterwards their maintenance in an efficient state, in diminishing, at least, the loss of life from these dreadful wrecks, deserves our cordial and hearty support. Hence it is that we bave somewhat stretched a point by publishing the foregoing engraving of one of the life-boats of the Royal National Life-Boat Institution proceeding off to the rescue of a shipwrecked crew, and thus manifest again our high appreciation of its indefatigable and successful exertions in a cause which is at once truly philanthropic and national in its character.

The original picture of our illustration was painted by Mr. Samuel Walters, of Bootle, near Liverpool. He was induced to prepare it at considerable trouble by a peculiar process of photography, in order to lay before the public a correct and picturesque view of one of these valuable lifeboats, with the intention of exciting a more general appreciation of their great services in cases of shipwreck, and of inducing the benevolent to extend their support to an Institution whose lifeboats, even during the present year, have been the means of snatching 146 of our fellow creatures from a watery grave. On very many occasions, it happened that when the lifeboats had put off in reply to signals of distress, the vessels had either got out of danger or their crews rescued by other means. Lifeboat crews also assembled several times to give assistance, but were not required to put off to sea. For these valuable exertions, the total sum paid to lifeboat crews, was £611. On these oceasions, and on those of quarterly exercise, the lifeboats were manned probably by no less than 4000 persons. Nearly all the services took place in stormy weather and heavy seas, and often in the dark hour of the night. Such practical proofs as these of the great value of the Royal National Lifeboat Institution in a maritime country like ours, cannot be overrated. It has now 108 lifeboats under its management, some of which are not yet on their stations, but, which will be there in a few weeks. On an average, each lifeboat station requires £40 a-year to maintain it in a state of thorough efficiency. It is therefore evident that this good work can only be perpetuated by permanent endowments, and the continued support of the public to the Lifeboat Institution.

We append a list of the lifeboat stations of this Institution, as it cannot fail to be of essential service at this period of the year to mariners and sea-going passengers. These boats form a truly noble fleet, outnumbered to be sure by the navies of commerce and war, but the largest life-saving fleet that tho world has yet seen:—

ENGLAND.

Northumberland—
Berwick-on-Tweed.
North Sunderland.
Boulmer.
Alnmouth.
Hauxley.
Newbiggin.
Cullercoats.
Durham—
Whitburn.
Seaton Carew.
Yorkshire—
Middlesborough.

Yorkshire—*continued.*
Redcar.
Saltburn.
Filey.
Bridlington.
Hornsea.
Norfolk—
Cromer.
Mundesley.
Bacton.
Palling.
Wint·rton.
Caistor.
Yarmouth, No. 1.
" No 2,

Suffolk—
Lowestoft.
Pakefield.
Southwold.
Thorpeness, No. 1.
" No. 2.
Aldborough.
Kent— Margate.
Walmer.
Dover.
Dungeness.
Sussex, Camber.
Rye.
Hastings.
Eastbourne.

Sussex—*continued.*
Newhaven.
Brighton.
Selsey.
Isle of Wight—
Grange.
Brooke.
Dorset, Lyme Regis.
South Devon—
Exmoutb.
Teignmoutb.
Cornwall—
Fowey.
Lizard.
Penzance.
Sennen Cove.
St. Ives.
Newquay.
Padstow.
Bude Haven.
North Devon—
Appledore, No. 1.
" No. 2.
Braunton.

WALES.

Glamorganshire—
Penarth.
Porthcawl.
Carmarthenshire—
Lanelly.
Carmarthen Bay.
Pembrokeshire—
Tenby.
Fishguard.
Cardiganshire—
Cardigan.

Merionethshire—
Aberdovey.
Barmouth.
Carnarvonshire—
Portmadoc.
Anglesey—
Llanddwyn.
Rhoscolyn.
Holyhead.
Cemlyn
Moelfre.
Penmon.
Carnarvonshire—
Orme's Head.
Flintshire—
Rhyl (Tubular).

Lancashire—
Southport.
Lytham.
Fleetwood.
Cumberland—
Silloth.
Isle of Man—
Castletown.

SCOTLAND.

Ayrshire—
Irvine.
Ayr.
Argyleshire—
Cantire.
Caithness-shire—
Thurso.
Banffshire—
Buckie.
Banff
Elginshire—.
Lossiemontb.
Aberdeenshire—
Fraserburgh.
Fifeshire—
St. Andrew's.
Haddingtonshire—
North Berwick.

IRELAND.

Co. Antrim—
Portrush.
Down— Groomsport.
Tyrella.
Newcastle.
Louth—Dundalk.
Drogheda.
Dublin, Skerries.
Wicklow—
Wicklow.
Arklow.
Wexford—
Cahore.
Wexford, No. 1.
Rosslare Fort, 2.
Carnsore.
Waterford—
Tramore.
Dungarvan.
Ardmore.
Cork— Youghal.
Ballycotton.
Mayo— Westport.

The following are extracts from the life-boat rules of management:—

"Each Life-boat to have a Coxswain Superintendent, with a fixed Annual Salary of £8

"The Life-boat to be regularly taken afloat for exercise once every quarter, fully manued and equipped, so that the Crew may be familiar with her properties and proper management. On every occasion of exercise, tbe men are paid 5s. each in stormy weather, and 3s. each in fine weather; and on every occasion of going off to a Wreck to save Life, each of the Crew receives 10s. by day and £1 by night, and equal shares of any Local Subscriptions which may be raised to reward any special act of gallantry or exertion.

"The Crew are provided with Life-belts. The Coxswain is required to keep a list of all the Life-boat Stores, which are to be examined once a quarter by the Local Committee in order to their being repaired or re-placed, if in the least degree in a doubtful condition.

"The Life-boat to be kept on ber Carriage, in the Boat-house with all her gear in her ready for use, except articles which require to be secured from damp. Signals are agreed upon for calling the Life-boat's Crews together; and immediately on intimation of a Wreck, or vessel in distress, the Coxswain is to muster his Crew, launch his Boat, and proceed to her assistance.

"The Local Committee to make quarterly inspection, and Report to the Institution as to the behaviour of the Boat during exercise, pointing out any defect that may be remedied, and offering any suggestion that may conduce to the efficiency of the service",

By these arraugements the National Lifeboat Institution hopes to have efficient lifeboat establishments all round the coasts of the United Kingdom. To effectually attain the objects of the Institution it will be manifest that a considerable expense must be incurred; amounting, in fact, from £300 to £400 on the first formation of a lifeboat station. The uumber of lives saved by the lifeboats of the Society and other means since its formation is 11,824; for which services 82 gold medals, 665 silver medals, and £13,000 in cash have been paid in rewards. The Institution has also expended nearly £40,000 on lifeboats, lifeboat transporting carriages, and boathouses. Without, therefore, the pecuniary assistance and the hearty general co-operation of the community at large, the objects of the Society cannot be carried out, and surely such an institution, devoted to such worthy and comprehensive purposes need not appeal in vain. Much has been done, but much yet remains to be done. Munificent donations from the wealthy few have poured in, in some cases the establishment of a perfect station having been presented; but it is from the small contributions of the many that such an establishment must derive its vitality. Everyday experience shows us tbat in this charitable laud the public have ouly to feel assured of the object being worthy, and that the money subscribed will be judiciously applied, for thousands and thousands to roll in immediately. We trust tbat the National Lifeboat Institution bas only to be more generally known to be placed upon a more permanent and extended footing. We must yet expect before the year is out to hear the roar of many a raging storm, and to read a few days after, of many a fearful wreck. Surely it would be a cheerful thought in the heart of any of us, as he listens to the one, or peruses the other, that he has fulfilled one of the many duties already required of us, by having carried or remitted bis mite to No. 14 John Street, Adelphi, London, or to Mr. Wm. Johnson, Patent Office, 166 Buchanan Street, Glasgow.

METROPOLITAN TRAMWAYS.

It is now nearly ten years ago since Mr. Thomas Wright, C.E., of George Yard, Lombard Street, London, proposed to relieve the streets of London from the enormous and increasing, as well as, dangerous traffic, by laying down two lines of rails flush with the surface of the road. These rails were to admit of trains running each way, and over which ordinary vehicles could pass after the passage of the trains, consequently, the full width of the streets would be available as before. Mr. Wright issued a very comprehensive circular on the subject, and endeavoured, but unfortunately without sucess, to interest the city merchants and others to form a company to carry out the idea. The object of the company was to condense and systemise, as well as to cheapen the transit of passengers, goods, and parcels through the metropolitan streets and its environs. The trains of carriages were to be propelled by horses, and to run every five minutes from the city to all the railway stations and every part of the suburbs, with stations at short distances to admit of passengers being taken up and put down as near their destination as possible, and to facilitate changing the route. The rails were proposed to be laid in the centre of the road, so as to give every kind of vehicle free access to the shops, warehouses, dwellings, or other places on each side of the rails. But at the appointed stations for stoppages, the rails were to be carried for a short distance parallel to the kerb, to facilitate the ingress and egress of passengers. This plan is well adapted for street purposes with rails laid on the level of the road, which would not interfere with the ordinary street traffic. It is well known that in the United States of America, such effects have been realised by the horse cars that run on the rails through the streets of New York, the railway being in many instances, carried through the streets of the principal towns. A railway is, for example, conducted through New York, and terminates at the very centre of the city near the park; another is carried through the streets of Philadelphia, terminating in Market Street; and in like manner a line of railway is carried through the streets of Baltimore, terminating near the harbour. In these cases the rails are laid flush with the road, a cavity being left on the inside of each rail, in which the flanges of the wheels play. There also, facilities for the construction of railways have been accorded by public feeling. Not alone through the finest square of the aristocratic quarter of New York, as well as the thronged business streets of that city, but through the thoroughfares of Philadelphia, Baltimore, and many lesser cities are rails laid down connecting the lines outside with the heart of the dense population;—and thus far for all practical purposes the objects attempted in England by city railway extensions and metropolitan termini, which bave swamped so much capital, are here obtained, not to perfection we admit, but at least at an insignificant outlay of capital. Consequently, the project here brought forward, will, by the application of more recent mechanical and railway improvements, establish a regular communication, east, west, north, and south of the metropolis, through the medium of rails running from point to point. This must prove a most important auxiliary in many respects to all the railways in London, and deserves the especial support of railway directors and shareholders, inasmuch as it will thus enable the various lines not only to form a junction with each other at a comparatively small outlay of capital, but become virtually, for all practical purposes, an extension of their respective railways; besides affording each of them a communication with all parts of the metropolis. Therefore it is manifest the advantages of this plan are, to combine all the metropolitan termini in the cheapest possible way, and in effecting that, it happily keeps clear of all existing vested interests; and it will, beyond doubt, yield a handsome return for the capital invested. It is not, however, customary in America to drive the locomotive engine through the streets. They are usually detached from the trains at a station in the suburbs, and the carriages are then drawn by horses in-waiting at the termini. In several of the American cities, the railways are continued to the very centre of the town, following the windings of the streets, and turning without difficulty the sharpest corners. The locomotive station is, however, always in the suburbs; having arrived there, the engine is detached from the train, and horses are yoked to the carriages, by which they are drawn to the passengers' depot, usually established at some central situation. Four horses are usually attached to these large oblong carriages, the body of which is placed upon two small trucks, one truck at each end of the body, which works on a pivot, this enables them to work round the sharpest curves. The quickest curves at the corners of the streets are turned by causing the outer wheels of the trucks to run upon their flanges, so that they become, whilst passing round the curve, virtually larger wheels than the inner ones, by this means the largest railway carriages enter the depot in Philadelphia, Baltimore, and New York, with as much facility and precision as was exhibited by the coaches that used to enter the gateway of the Golden Cross or Saracen's Head. As the railways have superseded the stage coach, in like manner, by the adoption of this comprehensive system of metropolitan street railways, will the omnibuses be superseded, and the interests of the public, which are clearly identified with this undertaking, will be promoted. There have been very few great works which have not, on their first introduction for public favour, met with strenuous opposition or objection, by those who may be personally interested in their failure, or who can only see the difficulties to be overcome, leaving out of sight the great end to be obtained by the invention. Hence, in the present undertaking, a few minor objections, mechanical or otherwise, may present themselves to those who have only superficially examined its merits. On further investigation, these objections will not be found of sufficient weight to detract from the general merits and practicability of the project, as most of these can only be mere matters of mechanical detail, or that of modification and arrangement in practice, and which can be easily obviated, and will not in any way affect the general and more comprehensive objects to be accomplished thereby.

The gauge of the railway was proposed to be four feet eight and a half inches, the same as the ordinary narrow gauge. The accompanying illustration represents one modification of Mr. Wright's street railway. The rails and sleepers are cast in one, and they are connected at intervals by transverse tie rods. In his recent patents Mr. Wright has variously modified the arrangement of the rails, and shown them with duplex grooves for the centre rail, also of the bridge form, and carried upon timber sleepers, as well as in other forms. Speaking of the carriages, Mr. Wright says:—

"It is proposed to construct carriages to occupy the same space in width as the present omnibuses, but having the wheels fixed underneath, in lieu of at the sides; by the adoption of which plan, an additional space of twelve inches will be afforded between the seats, which will be a decided improvement over the present omnibus conveyance, and would materially add to the comfort of the travelling community. The road in Fleet Street is 26 feet wide, and that of Cheapside 38 feet, while the width required by the proposed carriages in passing each other would only be about 12 feet, the same as that occupied by the present omnibuses, thus amble space would be left for the passing and repassing of other vehicles. Moreover, in consequence of being enabled to accomplish three or four times the amount of work by one pair of horses, the narrowness of the streets, instead of being an argument against the system, becomes the strongest reason and greatest necessity for its adoption, and the advantages attending it are obviously most important, practical, and strikingly apparent. The proposed carriages would convey more passengers with greater comfort than the present omnibuses, inasmuch as they will be constructed to accommodate 40 passengers, and these 40 passengers weigh about 2 tons, and the carriage $1\frac{1}{4}$ tons, together $3\frac{1}{4}$ tons gross weight of loaded carriage, while at the same time one pair of horses, by the reduction of friction, will propel with ease three of these carriages in one train, weighing altogether about 10 tons, and conveying a total of 120 passengers, or one large carriage may be adopted. On the other hand, about 24 passengers are carried in the present omnibus conveyance, and that with the same tractive force employed, or about five times as many, by which means two most essential objects will be ensured—cheap fares with increased accommodation to thepublic, and a profitable undertaking to the proprietors. Here then, in the proportion of conveying 120 passengers at one time, by one pair of horses, against 24 passengers of the present omnibus conveyance, there is evidently a saving of eight horses and two omnibuses, so that in this ratio, the 3,000 omnibuses now employed in London would be reduced to about 1,800. Thus effecting a saving of 1,200 omnibuses and 4,800 horses, besides economizing space and relieving the streets, which the present omnibuses occupy almost to monopoly. Inasmuch as one of the proposed trains, composed of three carriages, propelled by one pair of horses, would only occupy an area of 50 feet long by 6 feet wide, while, on the other hand, 5 omnibuses occupy at least a street area of 102 feet long by 6 feet wide, being one half more than that of those proposed, and showing therefore a saving of a street area of 52 feet in conveying 120 passengers over it. In 1,200 omnibuses, each 12 feet long, a saving in space is effected of 14,400 feet long by 6 feet wide, and that on 2,400 pairs of horses, each 8 feet long, 19,200 feet, which gives a total space saved in the streets, for the use of other vehicles, of 33,600 feet long by 6 feet wide; being nearly six and a half miles—or equal to an unbroken line of omnibuses extending from the Bank to the Broadway at Hammersmith; irrespective of this, the street space will be economized by the orderly and systematic working of the railway carriages, so as to be equally distributed over the whole metropolis.

Looking to the result of this undertaking as affecting the community at large, the increase of comfort and safety, with the additional capacity for passenger conveyance, in conjunction with the elasticity of a rail way—diminution of noise and jolting in the streets, as well as the reduction of expenditure in the wear and tear of carriages, and horse labour, will prove a most important advantage. The expense of horses will be reduced, on account of the diminution of the draught as well as the strain in pulling up, as the train will be arrested by breaks, which have complete control over it, and not by the horses as at present. The trains once set in motion, will require comparatively little pulling when they have got up to their speed on the rails, as its own momentum will materially assist to keep it in uniform motion, independent of the important advantage of the general diffusion of traffic over every part of the metropolis and its suburbs.

Another most important benefit also will be secured to the public by this undertaking, that the whole metropolitan omnibus transit of passengers will be under the immediate control and management of one responsible Board of Directors. The security, facilities, and advantages which this system would effect must be evident to every one, as compared with the present confused, irresponsible, and dangerous mode of omnibus conveyance through the streets of this metropolis."

Above all, economy of fares was made an indispensable condition; the single fare was to be threepence, any intermediate distance of a mile one penny. A sixpenny ticket would permit of the passenger passing from one line to another to reach his destination; day tickets were to be charged one shilling, and return tickets fourpence. We think we have said enough to show that Mr. Wright had carefully thought out a most comprehensive scheme of rapid, safe, and economical communication, admirably adapted for cities and towns. We urge attention to our remarks, because at the present moment a good deal of stir has been made by Mr. G. F. Train, who has been warmly pressing upon parochial bodies the subject of street tramways. We have no desire to detract in the slightest degree from the merits or exertions of Mr. Train, but we do desire to see justice to Mr. Wright's claim, which has so long lain in abeyance.

COMPARATIVE STRENGTH OF WIRE AND HEMP ROPES.

We have all along been labouring under the delusion that wire rope was stronger than hemp rope. But some practical experiments at Liverpool have undeceived us. Experiments were made at the suggestion of Captain Dallas, who is to take the command of a new ship building by Messrs. Chaloner, Hart, and Sinnot, for Messrs. Campbell, Cross and Co. This vessel is to be fitted with wire rigging. The testings were watched with considerable interest, as being connected with a question of the utmost importance to the mercantile community, more especially in relation to the fitting and safe rigging of vessels either in the navy or merchant service. The specimens of wire-rope submitted to the test were from the following manufacturers—Messrs. R. S. Newall & Co.; Messrs. Garnock, Bibby, & Co.; Messrs. Whaley, Burrows, & Fenton; and Messrs. Hutchings & Co.; and we may add that the specimens were privately purchased some time previously for Captain Dallas, and spliced for testing by Messrs. Newall & Co.'s workmen. Mr. W. M'Donald superintendent of the chain-cable testing machine, who acted throughout with the strictest impartiality, recorded the results of the various experiments as they proceeded. The following is a tabulated statement of the result:—

	Circumference. Inches.	Guaranteed strain. Cwt.	Tons.	Breaking Point. Tons.	Cwt.
Newall & Co.	4	28	0	19	15
Ditto	3⅝	22	0	16	10
Ditto	2½	11	0	7	15
Totals		61	0	44	0
Garnock, Bibby, & Co.	4½	24	8	26	10
Ditto	3½	15	6	18	5
Ditto	2½	7	8	8	15
Totals		47	2	53	10
Whaley, Burrows, & Fenton	4½	34	0	21	0
Ditto	3¾	20	0	18	5
Ditto	3⅛	15	0	14	0
Totals		69	0	53	5
Hutchings & Co.	4	19	6	15	0
Ditto	3 11-16	17	0	11	10
Ditto	2 9-16	8	11	5	0
Totals		44	17	31	10

A piece of wire rope, made by Messrs. Newall & Co., 1⅜ inch, weighing 3 lbs. per fathom, was then tested, and broke at 5 tons; a piece of 4½ inch Manilla rope, manufactured by Garnock, Bibby, & Co., was next tested, weighing 2¾ lbs. per fathom, and broke at 8 tons 5 cwt., showing that Manilla hemp rope is stronger, weight per fathom, than wire rope; and that whilst in the case of the latter the makers could not in any one instance substantiate their guaranteed strengths, the hemp rope makers were always well on the safe side. We are taught a good and seasonable lesson in this way.

Far too little attention has been paid to both the standing and running rigging of ships, as well as to cables. Whilst we write we find that the commander in chief of the French squadron on the Brazilian and La Plata station, in his report to the Minister of Marine on the disasters occasioned by the hurricane which visited the roadstead of Buenos Ayres on the 1st of September last, attributes the loss of most of the French vessels which were driven ashore or foundered to the weakness of their chain cables and to the lightness of their anchors. That opinion is borne out by the fact that not one of the foreign vessels then in the roadstead dragged or broke from their anchors. The Marine Department therefore renews the numerous recommendations which it has already addressed to the Chambers of Commerce on the coast and to shipowners relative to the insufficiency of the fitting out of French merchant vessels.

So much has been said as to the superior strength of wire rope, as compared with hemp, that we were hardly prepared for such a result as the one of which we have just written. Perhaps shipowners will in future reflect a little more before they rely so implicitly on wire.

HISTORY OF THE SEWING MACHINE.

ARTICLE XXXIII.

George Henry Smith obtained a patent on the 31st of May, 1859, in the specification of which he describes a mode of giving motion to the vibrating lever, which actuates the vertical or upper needle holder, by means of a crank pin attached to a plate or disc, fixed to and revolving with the driving shaft of the machine. This crank pin fits a slotted hole at one end of the vibrating lever, the slot being so shaped as to produce the required dwell or pause in the motion of the needle. The same crank pin also assists in imparting a to-and-fro motion to the under needle or looper, by passing it through a slotted hole at one end of the slide or holder, which carries the lower needle or looper. In sewing machines where a shuttle is used, a similar disc or crank pin may be employed for giving the to-and-fro motion to the needle lever and shuttle driver. Another part of this invention consists in causing the roughened plate of the feed motion to work on a pin or centre, attached to a presser, vibrating on a pin attached to an arm or frame, projecting from the bed of the machine, the position of the pin being adjusted according to the thickness of the cloth to be stitched. The vibrating lever above referred to is furnished with a projection, so that as it descends it will give motion one way to the presser and roughened feeding plate, by coming in contact with a projection on the presser, adjusted according to the required length of stitch. The roughened plate acts upon the cloth when feeding, but slides over it freely when returning to take a fresh hold for another stitch—this return motion being obtained by a spring.

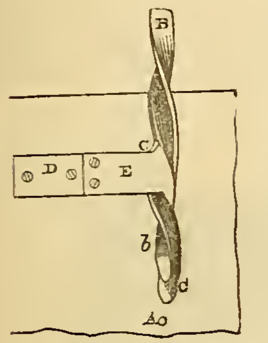
A patent was granted to Messrs. Wood and Billington on the 2d June, 1859, for an embroidering machine, the principal features of which appear to be the application of an additional row or rows of needle-holders to each of the original rows of needle-holders, whereby compound designs can be produced more expeditiously than by the previously existing machines. Also an improved mode of stretching or distending the fabrics in embroidering machines. Also an improved mode of jointing the levers and links of pentagraphs used in moving the fabric to be embroidered; and finally, the application of peculiar mechanism for applying spots and figures to fabrics in embroidering machines.

W. Clark obtained provisional protection on the 24th of June, 1859, for an invention communicated to him from abroad. This invention comprises a very complicated machine for sewing overcast work, such as is required in glove-making. The materials to be united are held together in a vertical position between the top edges of two gripping plates, and the sewing is effected by means of a hooked needle, working horizontally, and supplied with a severed length of thread. The cloth holders or gripping plates are made to travel at each stitch by suitable mechanism, so as to present the cloth in a fresh position to the action of the hooked needle.

Provisional protection was also afforded to E. W. Carter, on the 1st of July, 1859, for improvements relating to sewing machines, wherein a shuttle is employed, and consisting of a mode of slackening the thread, whereby larger shuttles may be used. For this purpose the thread is caused to pass through a lever, which is turned downwards or depressed by a positive motion, by the action of the needle slide or lever. This first mentioned lever is caused to turn back again or rise so as to tighten the thread by means of a spring, and the extent of its motion is determined by an adjustable stop. The connection of this lever with the needle-bar or slide is also rendered adjustable, so that the motion imparted to the lever may be regulated at pleasure. Another part of the invention relates to an improved mode of driving the shuttle, and consists, in the employment for that purpose, of a toothed wheel on the main shaft, which gears into a pinion on another shaft or axis carrying a crank, by the agency of which the shuttle is caused to traverse to and fro. A spring placed within the shuttle, and pressing against the axis of the bobbin or spool therein, serves to retard the revolutions of the latter, and so increase the tension of the shuttle thread.

R. A. Brooman obtained a patent on the 4th of July, 1859, for an invention communicated to him by Joseph Poole Pirsson, of New York. This invention consists of an improved hemmer or apparatus, to be used in conjunction with sewing machines, for the purpose of turning over and presenting the edge of the fabric properly folded to the needle, when producing hemmed work. Fig. 223 represents the improved hemmer in its place upon the table of a sewing machine, a portion only of which is shown. A, is the hole in the table through which the vertical needle of the machine works in the usual manner. B and C are two twisted strips of metal, which constitute the guide pieces for turning over the edge of the fabric so as to form a hem. These two strips are completely detached from each other, so as to leave a narrow winding slot or passage between them, extending nearly to their inner or delivering ends towards the needle. Each strip is secured to a separate plate; the strip, B, being secured to the plate, D, and the corresponding strip, C, to the plate, E. The plate, E, being screwed upon the plate, D, as shown, causes the joining of the two strips in their proper positions. The plate, D, is then secured upon the table of any sewing machine, in its proper place with reference to the needle, and the hemmer is ready for use. The strip, B, is rather shorter than the other, and is so twisted as to take one complete turn, finishing by lapping upon C, as shown at *b c*. The strips are also tapering at the delivery end, so that the fabric, which at this place is completely wound round them, may glide easily off to the needle. The end of the strip, B, presses upon C, so as to pinch the fabric at this place, and keep the hem, formed at its arrival here, firmly in position, so that it will not unwind before reaching the needle. In using this apparatus the fabric to be hemmed is laid upon the table, so as to cover the plates, E and D, that is to say, its edge is presented from that side. This edge is now introduced between the two strips, B and C, at the back end farthest from the needle. On pushing forward the fabric, its edge will become wound round the strips, and by the time it reaches their forward end, will be doubled or turned over into the form of a hem. So soon as the advancing edge is caught by the presser foot and feed apparatus, the sewing will progress in the usual manner, the fabric being drawn from off the hemmer, and folded down at the edge, as fast as the sewing proceeds. The stitch is formed on the top side of the fabric, and is locked or secured underneath in any well known manner, the line of stitching being made close up to the edge of the part folded over. This is a most excellent and simple contrivance, and answers the purpose admirably, as we can testify from our own observation, having seen it producing a hem of not more than one-twelfth of an inch in width; whilst, at the same time, the speed of the machine was wholly unaffected.

Fig. 223.



Provisional protection was granted to W. E. Newton, on the 22d of July, 1859, for an invention communicated to him from abroad, which invention relates to a mode of producing a "back stitch," similar to hand work, by mechanical means. The needle employed is seized by two pincers, the one acting above, and the other below the table which supports the fabric.

A patent was granted to Henry Fletcher, on the 2d of August, 1859, for improvements in sewing and embroidering machines. This invention is of too complicated a nature to describe intelligibly in an abstract form, but we may draw the attention of our readers to a few points of interest referred to in the specification, without entering into the mechanical details. The improvements relate to shuttle machines, and to running stitch machines, in which latter there are some points of real novelty to refer to. The improvements in the shuttle machines relate, among other things, to the feed mechanism, and to the construction of the shuttle or thread-holder. The thread is contained in the shuttle in the form of a cop, an arrangement we have already referred to on a previous occasion. The shuttles are made larger than usual, so as to be capable of holding more thread, and they are pointed at both ends, whereby a stitch is formed at each stroke. Figs. 224 to 229 inclusive, illustrate an improved knot stitch, which the inventor produces by causing the shuttle to pass through a loop of its own thread as well as through a loop of the needle thread. In fig. 226 the shuttle, A, is represented as having locked a loop of needle thread, and passing through another loop in its return stroke, a loop of its own thread being left hanging between the two stitches. In fig. 227 the second needle loop is shown as drawn up, and a third loop formed, the shuttle thread loop lying in the path of the shuttle before entering the third needle loop. Fig. 228 shows the shuttle as in the act of passing through the loop of its own thread, and through the third needle loop; whilst in fig. 229 the shuttle is supposed to have completed its traverse, and drawn up, or tightened the knot. Figs. 224 and 225 show this knot stitch formed on each alternate loop of the needle thread, and on every succeeding loop. In the description and diagrams here given, the knot will be formed on each alternate loop. Provided there is not more than ordinary risk

Fig. 224.

Fig. 225.

Fig. 226.

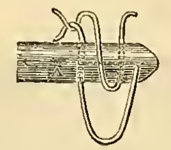
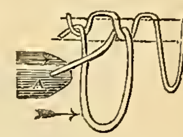
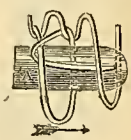


Fig. 227.



incurred of the shuttle missing its loops when driven at a high speed, we should say that this knotted or tied stitch is one greatly to be recommended, as it must certainly be a perfectly fast stitch, the locking thread being literally tied in a knot to each or every alternate loop of the needle thread. It is, certainly, a most ingenious and effective mode of interlocking the two threads. The specification also refers to the producing of hemmed work and overcast stitching, such as glove work, by the aid of helical pointed needles made to rotate on their axis, but we fear this will hardly be found to answer in practice. We may mention one simple and convenient appliance described in Mr. Fletcher's specification, namely, a bobbin stand, which is to be fitted so as to be free to rotate on the machine, and is provided with a large number of bobbins of thread of different degrees of fineness, so that on a change of thread being required, the desired thread is selected and passed through the needle without necessitating the removal of the bobbin previously in use.

Fig. 228.



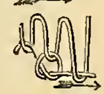


Fig. 229.

James Drabble obtained provisional protection on the 18th of August, 1859, for certain improvements in sewing machines, comprising the use of a double-grooved cam roller, which actuates two lever arms—the one giving a horizontal motion to the lower needle, and the other imparting the vertical movement to the upper needle of the machine. This cam is so made as to admit of the machine being worked in either direction without interfering with its proper action. The second lever referred to above is connected to the needle slide, to the lower part, and on one side of which is fixed a round arm, by means of which the roughened part of the foot is lowered at the same time that the upright needle slide is being raised. The slide being bent at its lower part, forces (when raised) the stitch bar or feed horizontally backward, when it again forces the bar connected with the foot, drawing, at the same time, the cloth along with it ready for another stitch. On the lowering of the slide the roughened part of the foot is raised, and the bar and presser-foot fall forward to their former position. The machinery employed for working the horizontal needle consists of a lever arm connected to a bar, to which is attached the needle. This bar, being uneven, gives to the needle a slightly curved motion in passing round the hole through which the upper needle passes The stitch so produced is the double chain (Grover and Baker stitch), which cannot be unravelled.

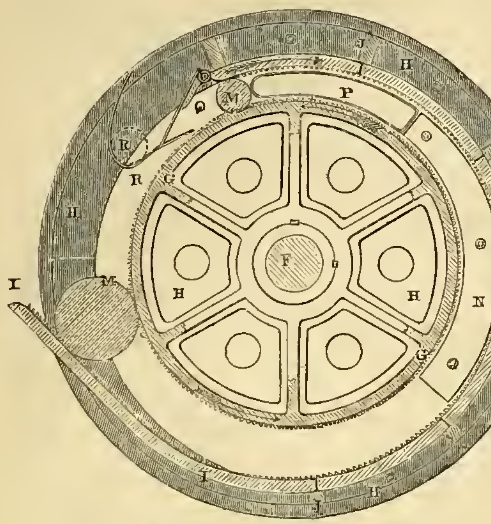
A patent was granted to Charles Tiot Judkins, on the 24th of August, 1859, for a machine in which the shuttle is dispensed with for carrying the under thread, and, in lieu thereof, a covered reel or stationary bobbin is used, containing the reel on which the thread is wound. The slack is taken up by means of a lever worked by a cam or other convenient known means. A hook revolves or reciprocates horizontally round the stationary bobbin and catches the needle thread, which is thereby interlocked with the under thread, producing a knot stitch having the same appearance on both sides of the work. The general arrangement of the thread case and rotating hook is very similar to the previously patented arrangement of Mr. Hazeltine, noticed by us in our article of last month.

William Clark obtained a patent on the 27th of August, 1859, for an invention communicated to him from America, consisting of a very complex arrangement of mechanism for uniting or ornamenting fabrics by the aid of three threads. We cannot attempt to give illustrations of the apparatus employed, as it is of too intricate a nature, and, unfortunately, the specification itself does not throw much light upon it. We had intended (at first sight) giving diagrams of the improved three-thread stitch, but, on a closer examination, we found that the diagrams were not clear enough for our purpose. The stitching is produced by the aid of two parallel vertical perforating needles, each provided with its own thread, and a "non perforating" needle, or vibrating looper, which passes a third through the loops of one or both of the two vertical needles.

MACHINE FOR BLOOMING IRON.

Our trans-atlantic brethren, in the manufacture of iron, commonly make use of a blooming machine, or "shingler," for compressing the puddle balls after leaving the furnace. With us, the puddle balls are usually subjected to the action of a powerful steam hammer. The subjoined engravings illustrate a recently patented blooming machine, by Mr. J. Arrowsmith. Fig. 1 is a vertical section of the main portion of the machine taken through the dotted line, shown in fig. 3; fig. 2 is a

Fig 1.



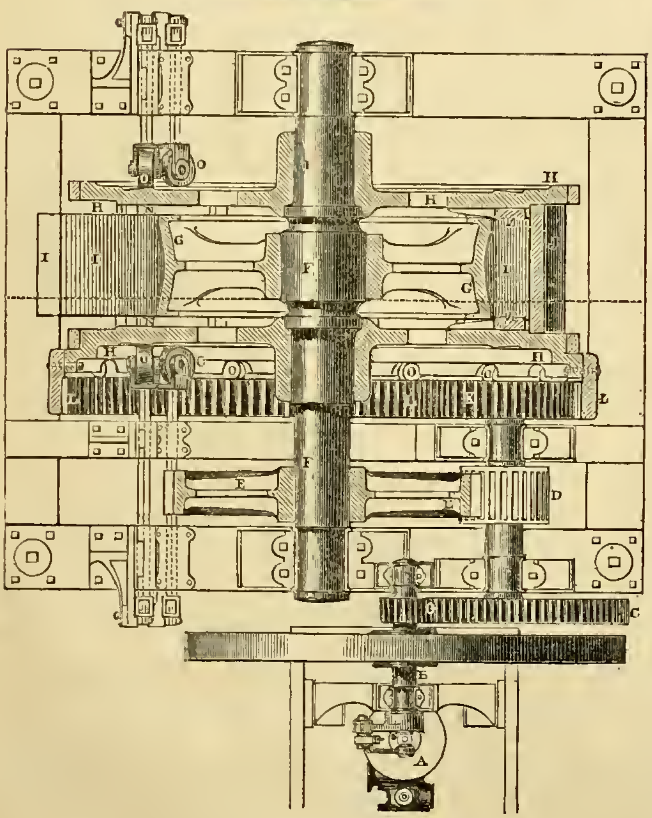
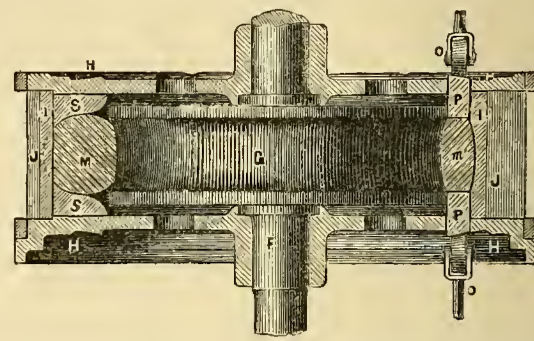


Fig. 2.

section taken at right angles to fig. 1; and fig. 3 is a transverse vertical section, showing the arrangement of the machine. The moving parts of the apparatus derive their motion from the engine, A, which is arranged at one end of the machine. The piston rod of the engine is connected in the usual way to the crank shaft, B, which carries a fly-wheel to equalise the motion of the moving parts. On the shaft, B, is a pinion, which gears with the spur-wheel, C; this wheel is keyed to a heavy horizontal shaft, the pedestal bearings of which are carried on the end standards of the rectangular framing of the machine. This shaft has fast to it the pinion, D, which drives the spur-wheel, E, keyed to the main horizontal shaft, F. Parallel with the wheel, E, and keyed to the shaft, F, is the cylinder or drum, G, the periphery of which is concave and grooved, as shown in figs. 2 and 3. Outside the drum, O, is a cylindrical casing, H, the parallel end plates of which rotate loosely on the shaft, F. The space between the end plates, H, is filled in with segmental plates, I, which are arranged in a circular figure, but disposed eccentrically to the drum, G. The inner surface of the plates, I, are grooved or serrated in a vertical direction, corresponding to the periphery of the drum, O. Abutting against the joints of the segmental plates, I, are fitted the vertical stays, J. To the rim of one of the end plates, H, is bolted the annular wheel, L, which derives its motion from the pinion, K, on the shaft carrying the pinion, D. With this arrangement, it follows that the drum, G, will travel round in one direction, and the outer casing in the

Fig. 3.



opposite direction. The puddle ball, M, is dropped into the mouth or wider part of the eccentric channel, and is carried round by the grooved surfaces, G and I, moving in opposite directions, and by which the puddle ball becomes gradually compressed as it travels into the narrower part of the channel. The blooms are "upset" by the taper plates, N; these plates compress the bloom end-ways, until it arrives at the plates, P, which are acted upon by the adjustable rollers, O, to which any desired degree of pressure may be imparted in any convenient manner. The bloom after passing the upset plates, P, strikes against the door, Q, which it opens and falls into the trough, R, from whence it is removed to the forge rolls. The machine is compact and highly effective in its arrangement.

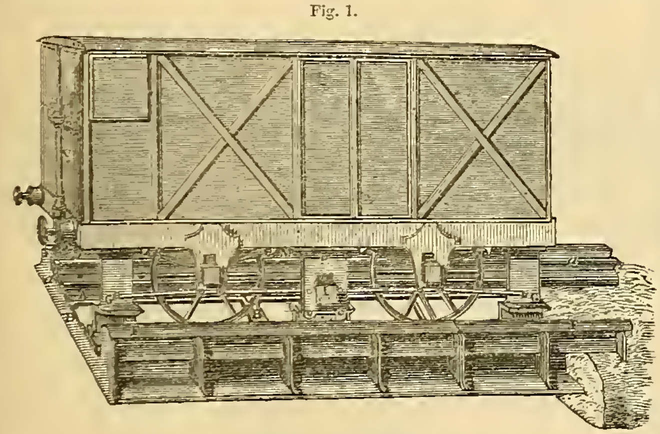
PICKING ORE BY ELECTRO-MAGNETISM.

Professor Bucci, of the Institute of Superior Studies at Florence, Director of the Iron and Copper Mines of Traversella, in Piedmont, and one of the most distinguished geologists and mining engineers of Italy, has just published a highly interesting account of the mines above alluded to, containing a description of a new process for separating copper ore from iron ore, invented by M. Sella, an engineer well known to the scientific world by his "Studies on the Mineralogy of Sardinia." The mines of Traversella have been in activity from a very remote period, it being believed that they were first worked under the Lower Empire. The horizontal development of their galleries measures 75 kil., or 47 English miles, and they belong to different proprietors, one of whom, Chev. Ricardi di Netro, remarking that the iron ore obtained was intermingled with a considerable proportion of copper pyrites, requested M. Sella, in 1854, to examine whether copper might not be extracted as well as iron. After much attention to the subject, M. Sella declared that the copper pyrites were much too thinly disseminated among the magnetite or magnetic iron ore, to be profitably separated by the common process of picking; that the specific gravity of the two ores was so nearly alike that they could hardly be separated by washing; and lastly, that, owing to the high price of combustibles, the chemical affinities of copper and iron could not be turned to advantage. At length, however, M. Sella hit upon a plan which has been crowned with complete success. We have several times had occasion to describe electro-magnetic machines, the great principle of which, our readers will recollect, consists in this: that a bar of soft iron can be temporarily magnetised by an electric current, and be made to lose its magnetic power instantly by the cessation of the current. M. Sella had recourse to this principle, and invented an apparatus, consisting of a wheel provided with 54 electro-magnets, which, being turned over the ore, previously triturated by stampers, attract, when magnetised, all the magnetite, which they let fall elsewhere on losing their magnetism. By this highly ingenious method all the copper pyrites, which, of course, cannot be attracted, is duly separated, at a very small cost, from the iron ore, among which it was previously as good as lost. Magnets have long been used in our workshops for the purpose of separating metallic particles, such as chippings and filings from foreign matters, but this apparatus is a great step beyond what we have done. In our case the magnets could only gather a mere coating of metallic matter, which had to be removed manually; here the gathering and removal are effected automatically, in the most elegantly beautiful manner, by the simple motion of the magnetic wheel.

WRIGHT'S SAFETY RAILWAY.

Railway Directors, speaking in a collective sense, are about the best abused class of men in existence, and they have certainly done much to deserve their unenviable notoriety. They, however, have it in their power to become the most popular of men if they would only adopt for their motto, "speed and safety," and do their utmost to carry it out in practice to the full extent. The establishment of railways throughout the country has placed the public in the hands of a gigantic monopoly, in which it is wholly powerless. In return for the vast amount of business transferred to railways, the public has, at least, a right to expect that its safety will be the leading care of the management. We wish we could say this was the rule, and not the exception, as unfortunately happens. Every one knows what disastrous accidents have occurred from the engine or a portion of the train leaving the rails; and one cannot avoid a feeling of astonishment that nothing in the way of a guard or preventive has hitherto been brought into use. Can any one travel over a lofty embankment or viaduct without a shudder if he gives a thought of how small a matter holds the train on its course. Let the engine but rise some couple of inches, or leave the rails from any other cause, and there is absolutely nothing to prevent the train and its living freight from being hurled to destruction. No guard—no means whatever is at present employed to prevent the engine and train from rolling

Fig. 1.

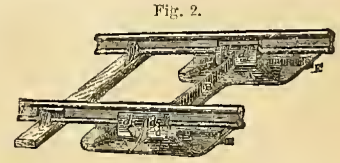


to the bottom of the embankment, or from plunging sheer off from a viaduct. Fortunately such appalling accidents are of rare occurrence; still they have happened, and if there is any means of preventing them, there ought to be no hesitation about adopting it. We are desirous of directing attention to some recent improvements in railway construction by Mr. George Wright of London, C.E., who has obtained letters patent for a system of safety rails which will, on its introduction, do an immense deal to extend public confidence in railway travelling, as well as to admit of an important augmentation of speed.

This system of safety rails is adapted to prevent injury to the engine or carriages should either, from any cause, get off the rails, and in the event of a wheel or an axle becoming fractured, the carriage slides harmlessly along on the surface of the safety guards extending along on each side. Such a system, if introduced only at embankments, viaducts, and other points exposed to danger, would certainly find favour with all who travel; and who does not, in these days of rapid locomotion? In the accompanying illustrative figures we have delineated several modifications of Mr. Wright's railway details.

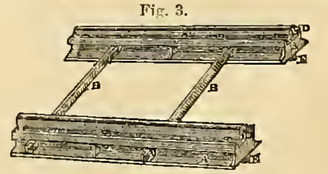
Fig 1 shows the bedplate iron safety railway. The safety kerb, F, for preventing the engine and carriages from running off the line is situated externally to the rails, and combined with the longitudinal bedplate iron sleeper, A, in one solid piece. The life guard, G, is fixed at each of the four corners of each carriage, engine, and tender, and in case of an axle, tyre, or other part breaking, the life guard simply drops down upon and within the safety kerb, which not only supports the carriage, but immediately becomes a skid or break, and so assists to stop the train, while it also prevents the carriage from swerving, rearing, or running off the rails. If any wheel in the train should mount, or get off the rails, it is resisted by the safety kerb, and in addition also by the combined protection of both the safety kerb and the life guard. No carriage can leave the line, or fall down upon the rails, or be upset, because when any break down occurs, the carriage can only drop down through a space of three inches; it is then transformed into a sledge, resting safely upon and between the safety kerbs, and is thus securely supported from falling. The carriage is also confined to the line until the train is brought up without injury to any person. The improved sleepers enable the trains to travel at an increased speed with less liability to derangements and accidents, and at a reduced cost for maintenance both of road and rolling stock. The sleepers are either detached or attached together at their ends, and the rails, *a*, break joint with them. The rail is inserted in a recess to prevent its lateral displacement by the side blows of the wheels, and is held down therein by bolts; there is a timber or India-rubber cushion interposed between the rail and sleeper to absorb the blows of the wheels, thus imparting soft, and even running with increased durability of the rails and ballast. Defective or worn out rails are removed and replaced with the greatest facility without disturbing the sleepers or ballast. The train breaks, L, are applied to the safety kerb, F, instead of to the wheels, by which the present enormous wear and tear of wheel tyres, axle boxes, and rails are reduced, besides doing away with the severe and dangerous strains upon the axles. By these means a more powerful bite is obtained, and this arrangement of break power is also applied directly to the momentum of the carriage instead of to the rotation of the wheels as at present, so that in cases of collisions its action is quick, and the whole weight of the carriage is thrown directly upon it, at the same time it forms in itself an extra life guard as well as break. The bedplate iron sleepers are 12 feet long, adapted to either 24 feet bridge, flat-bottomed, or double headed rails. The rail joints alternate, and timber packing is interposed between the rail and sleeper, also below the train safety kerb and breaks, F and L. The relative position of the kerb with the edge of the wheel tyre is externally the same as that existing between the flange of the wheel and the edge of the rail internally. Fig. 2 represents Mr. Wright's transverse bedplate sleeper, A, with the vice jaw rail fastening, *d*. This sleeper is adapted for being introduced into the line gradually, in connection with wooden sleepers, by being applied, in the first place, for the joint sleepers of

Fig. 2.



existing railways, thereby using up the wooden intermediates, and, as decayed intermediate sleepers are discovered, replacing them with iron. Hence, by degrees, the wooden intermediate sleepers are replaced by iron, by which means, without change of system or rails, a substantial substructure is obtained on the line throughout. The application of the iron transverse joint sleeper to the rail joints of existing railways does away with two wooden sleepers, four chairs, four wooden keys, eight spikes, four fish plates, and eight bolts, together thirty loose pieces, as well as their cost, constant attention, and repairs, while the improved sleeper is in few parts, easier of application, and is much more safe and durable. The rails have a large bearing surface upon the sleepers, and the sleepers also upon the ballast, with a deep lateral resisting surface, E, embedded therein, and thus knocking the rails out of gauge and line, or tipping or shifting of the sleepers, is rendered impossible. As the solid tie sleeper bedplate, A, and ballast fang, E, form an extended base to the rails, they prevent any rocking movement arising from lateral blows and the side lurches of the wheels, while less supervision of the rail fastenings, lifting of the road, or heating up of the sleepers is required. By the interposition of end grain wooden cushions upon which the rails are supported throughout, and the security of the vice jaw fastening, the under side of the rail is prevented from hammering and indentation, whilst the upper surface is in use, and, combined with the strength and steadiness of the fastening, greater durability is imparted to the rails. The rail joints are supported and secured without the use of loose chairs, pins, and keys. Fig. 3 represents the

Fig. 3.



longitudinal bedplate sleeper with loose tie bars, B, which are secured by cotters. In this modification the sleepers are adapted to receive the flat bottomed bridge rail, between which and the sleeper is interposed a cushion of wood. These sleepers are also provided with the longitudinal ballast fangs, E, to resist the lateral pressure. Fig. 4 represents the longitudinal bedplate iron sleeper, with loose tie bars and the ordinary double-headed rail applied, and this form may also be gradually introduced into the road as the longitudinal wooden sleepers decay. Timber or India-rubber cushions are interposed between the rail and sleeper to absorb the blows of the wheels, and impart easy and even running, with increased durability of the rails and ballast. Fig. 5 is a vertical section of another sleeper, arranged for the ordinary double-headed rail.

Fig. 4.

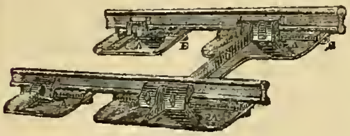
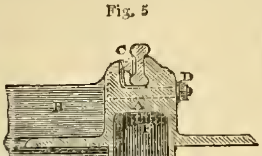


Fig. 5

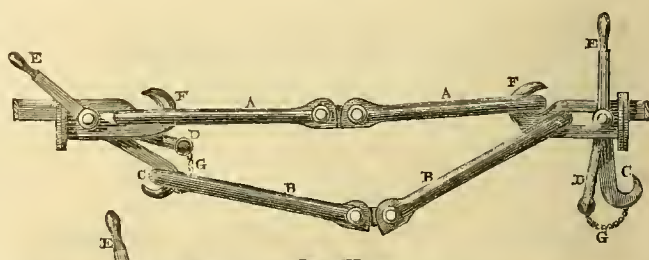


The sleeper, B, is cast of a saddle form, and is arranged on the longitudinal wooden sleeper, F. The tie bars, B, are cast in one with the sleeper, and there is also a transverse rib or ballast fang, E, extending across between the sleepers. The double-headed rail is tightened up against the shoulder of the chair by the wedge piece, c, which is connected to the laterally projecting bolt fitted with the nut, D. In this manner, defective or worn out rails are removed and replaced with the greatest facility without disturbing the sleepers or ballast.

RAILWAY COUPLING GEAR.

We have from time to time commented upon "Our unwillingness to adopt obvious improvements," and we hope we have shown good reason for so doing There is certainly no public body to which a series of papers on this subject could be addressed with greater propriety than to Railway Directors. We are guiltless of the slightest exaggeration when we say, that there is not a single department in railway management in which the safety and comfort of the public might not be far more efficiently cared for than at present, and this too with little additional expenditure. But we are, unfortunately, at the mercy of a comparatively irresponsible body, and we must perforce do the lordly bidding of the "board." Rich and poor must travel at whatever time and in whatever way the "board" chooses to dictate. Even the wealthy are fain to put up with shabby, drafty, dusty, ill conditioned carriages, whilst those of more restricted means are housed in pens which are scarcely fitted for dog kennels. But this is far from being the sum total of our discomfort, for no sooner is the train in motion than danger assails us in a hundred different forms. Our own or a neighbouring carriage catches fire, and there is no means of communicating to the guard or engine-driver; on we must go, with the blazing timber around us. Or a passenger is taken ill and requires immediate assistance; no matter, the Directors ignore signal apparatus, because silly or improper use might be made of it. Then we may be shunted on to the wrong line from some defective action of the points. Or a coupling gives way and one half or more of the train runs back into a tunnel, or hurries on to meet destruction and an express train which is following us. We are not by any means drawing upon the imagination, we are stating sober facts, and the memory of every intelligent reader will furnish him with numerous accidents which have occurred from the causes we have named, and they are far from being the only sources of mischief and loss of life on our railways. It is a fact notorious to every one, that unless an inventor or patentee has a "friend at court," either at the "board" or in the person of the managing engineer, it is next to impossible for him to get an invention, however meritorious, put into practice. It is the policy of Directors to discourage improvements, to taboo inventors as a troublesome if not dangerous class of people. Let it be understood, that we do not for a moment advocate the indiscriminate adoption of all and sundry of the schemes which are submitted to the management of our railways. Far from it, what we desire to see is, that a fair stage and no favour be shown towards such improvements as give a reasonable promise of public utility; and what we assert is, that the public safety is not considered with that amount of zeal and intelligent attention that the paramount importance of the subject demands. In too many instances the miserly consideration of *£, s. d.* is allowed to ignore many a good thing, and that this is done from a mistaken economy is obvious, for both the shareholders and the public suffer by it. The public lose by it in being exposed to an unnecessary amount of danger, as well as travelling at a lower speed than might otherwise with safety be employed. The shareholders lose by being called on to pay for accidents, which in too many instances could, with improved appliances, be averted. Take as an example the simple matter of mechanical detail employed for coupling railway carriages. Why, this very simple, and, as some may too hastily think, contemptible thing, has been the cause of an immense loss of life, as well as frightful and irreparable injuries to passengers, and destruction of property. This may be true, says one, but have you anything better to propose. We say at once, yes; we have on more than one occasion brought forward superior modes of coupling carriages, but we will at the moment confine ourselves to one example which is not a theoretical idea, but the invention of men who were practically engaged in railway management, and whose mode of coupling has been in use with great success on the Morayshire line. We are referring to Messrs. Taylor and Cranstoun's coupling gear, a large plate of which we gave at page 30 of our eighth volume. We again refer to this invention in the hope that its self-evident merit will be the means of causing it to come into general use. In plate 170, to which we have referred, three links are shown at each end of the carriage—one central draw link and two side links. The inventors consider the two side links superfluous, and only put them there to satisfy such parties as consider side chains (in the existing system) indispensable. Only one central draw link is used on the Morayshire line, where, as was before stated, the system is in operation. If the side links were dispensed with, the cost of adopting the improved system would be no greater than that of the system at present in general use. It might indeed be considered that it would be attended with danger to run trains with only one draw link. This objection has, however, been entirely obviated by a very simple, yet complete contrivance. It is as follows: as all the carriages and waggons have a draw link at each end, the link being passed through the eye of the draw hook, it follows, that when the carriage or waggons are connected, there will be a spare link hanging vertically from each. This link, by a simple movement of the lever handles, is thrown over a service hook, which is suspended from the transverse shaft, as shown in fig. 1 of the subjoined engravings, in which, A, is the draw link; B, the spare link; C, are the service hooks; D, the lifting levers; E, the lever handles; F, the draw hooks; and G, chains for moving the service hooks The service hook hangs loosely, but is perfectly secure; and therefore, should the draw link break, the spare link would at once be brought into action, and assume the position of the draw link. Hence the necessity of side links (in lieu of side chains) is entirely obviated. Practically considered, this is in every respect preferable to side links, inasmuch as the draw would, under every circumstance, lie in the centre of the train. Several railway companies dispense with the use of side chains, as they have found from experience, that should the centre or

Fig. 1.



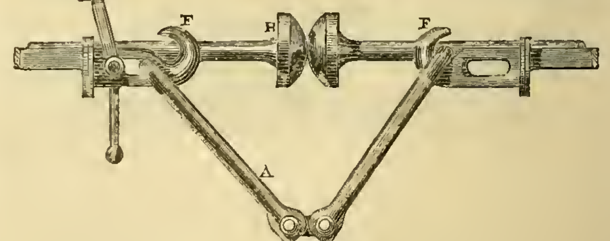


Fig. 2.

draw shackle break, they have a tendency to draw the carriages or waggons off the line. Fig. 2 shows the position of the draw link when the buffers are compressed. The link has always a downward folding tendency, that is, a tendency to assume the form of the letter V when not straightened by drawing.

Accidents are frequently occurring to passenger trains from the carriages becoming disconnected on the journey This arises from the defective character of the screw coupling at present in use (which is a straight bar with short joint links at each end). When compression of the buffers takes place, it has a tendency to throw the short links over the draw hook, thereby disconnecting the carriages. Several fatal and expensive accidents have arisen from this defect. The new system, however, entirely obviates it. From the construction of the centre joint of the link, the greater the compression of the buffers, the more secure the link becomes. At all times, the lives of railway servants are endangered from having to pass betwixt the carriages and waggons to couple or uncouple them, which fact is well substantiated by the number that are killed and injured yearly from being crushed between the buffers, and from being thrown down while between the carriages or waggons. Messrs. Taylor and Cranstoun's system precludes the possibility of such accidents, as the actions of coupling and uncoupling are completely performed by a simple movement of either lever handle at the side of the carriages or waggons. Railway engineers are here placed in possession of a good and practical means of avoiding, at least, one fruitful source of danger: it remains to be seen how much longer they will persist in disregarding so obvious an improvement.

COPYRIGHT OF DESIGNS FOR ORNAMENTING ARTICLES OF MANUFACTURE.

The Lords of the Treasury, upon the recommendation of the Board of Trade, and in consequence of a memorial from the Council of the Chamber of Commerce for Birmingham and the Midland District, have reduced the fee for registering ornamental designs of articles composed wholly or chiefly of metal, from £3 to £1.

RECENT PATENTS.

RIFLING FIRE-ARMS.

The Right Hon. Lord Berwick, *Salop.—Patent dated April* 28, 1860.

The improvements introduced by Lord Berwick relate to an improved system or mode of rifling the barrels of such fire-arms as are intended for elongated, expanding, or soft metal bullets, whereby fouling, and consequent difficulty of loading, is entirely prevented. According to this invention, which is applicable either to existing rifles of the ordinary grooving, or to the rifling of new barrels, it is proposed to cut a supplementary or additional groove or grooves in each of the bearings or lands between the ordinary rifle grooves. Any form of groove may be used, but it is preferred to make the edges or shoulders of such

Fig. 1.

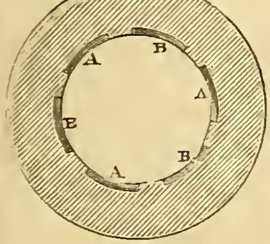
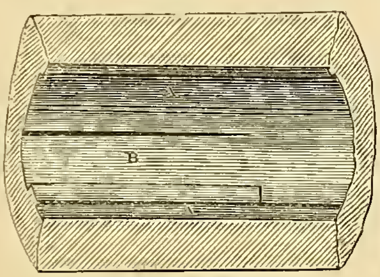


Fig. 2.



grooves slightly chamfered or bevelled inwards, so as to make the groove narrower at its bottom than at the top, which chamfering may also be applied to the ordinary rifle grooves, whereby a smoother edge is obtained, and are less liable to hold and accumulate foulness, whilst it is at the same time more easily cleaned.

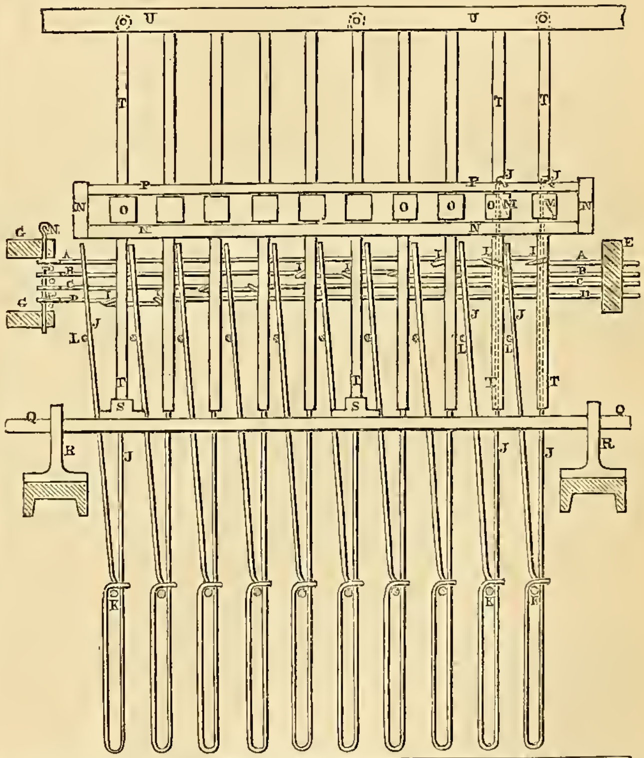
Fig. 1 represents a transverse section taken through the breech of an Enfield rifle barrel, rifled according to the patentee's invention, showing the additional or supplemental grooves made at that part; and fig. 2 is a plane or flat projection of the barrel, showing the additional or supplementary grooves in connection with the usual rifle grooves. *a*, are the rifle grooves proper, which extend from the muzzle to the breech, and, *b*, are the additional or supplemental grooves, which are made by any suitable rifling apparatus. These supplemental grooves are made in the lands or surface of the barrel, between the ordinary grooves, and extend only partially along the barrel, from the breech towards the muzzle. These grooves are cut deepest at the breech, and are made gradually shallower as they proceed in the direction of the muzzle, until they die away into the surface of the land or bearing, at a point, the position of which will vary with the length of the barrel, but it may generally be situated midway between the breech and the muzzle. The grooves may be made of any form, but it is preferred to make them with slightly bevelled or chamfered edges, a correspondingly shaped cutter being employed, so that both the sides and bottom of the rifle grooves are cut, in place of having the bottom only cut, and the metal from the sides torn out without being aetually cut, which renders them more or less jagged, and more liable to foul than when they are cut smooth in the manner described.

JACQUARD MACHINERY.

John *and* Alexander Shields, *Perth.—Patent dated March* 15, 1860.

Messrs. Shields' present improvements have reference to various arrangements of Jacquard looms or machinery, so contrived as to secure a more effective system of operation in weaving, combined with a wider range of action for manufacturing certain classes of ornamental goods than has hitherto been the case, and it bears importantly upon an invention of "improvements in Jacquard looms or machinery for weaving," for which Mr. John Shields obtained letters patent in 1859.* The present improvements may or may not be worked in conjunction with those set forth in the specification of the invention referred to, but, when so combined for operation in ornamental weaving, they consist essentially in giving the branders a horizontal traverse motion to and fro in addition to the ordinary ascending and descending motion, as employed for raising the Jacquard wires or needles. This horizontal motion is effected by a differentially formed cam or working barrel, which is caused to rotate in concert with the ordinary Jacquard barrel, and at any desired speed in proportion to the speed of such barrel. With this arrangement the pattern working range of the Jacquard is very greatly increased, whilst the vertical needles or cleeks do not require any horizontal traverse in themselves, and the most effectual provision for twilling the fabric can be made to any extent, by so gearing the wires that any desired alternations of numbers may be lifted. Fig.

Fig. 1.



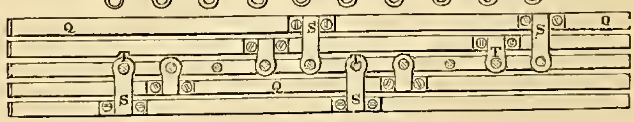


Fig. 2.

1, of the accompanying engravings, is a partially sectional elevation of one modification of the patentees' improved arrangement of Jacquard apparatus; fig. 2 is a plan of the mechanical arrangement for actuating the brander slips, and bringing them in contact with the cleeks or vertical wires, as well as throwing them clear of the same. In this modification there are four rows of horizontal needles, A, B, C, and D, the front ends of which pass through the guide, or needle board, E; the backward ends are formed into loops which pass between the horizontal

* See *Practical Mechanic's Journal* for June, 1860, p. 67.

wires, F, that are arranged in the box, G. Through the several loops of each vertical row of needles a wire, H, is passed, which serves to retain the needles, the length of the traverse either backward or forward being regulated by the length of the loop formed at the end of each needle. The action of these needles forms the figures in the fabric to be woven, and this action is obtained by means of an ordinary Jacquard barrel and endless chain of perforated cards. The hexagonal card barrel is fitted in front of the free extremities of the pattern needles, A, B, C, and D, so that, as it rotates with its chain of cards, the needles are either thrust back by the ends coming in contact with the solid parts of the cards, or they are allowed to come forward by the ends passing through the perforations. Each of the needles, A, B, C, and D, has formed in it three or other number of loops or elongated eyes, I, through which the upper part of one of the vertical hooked wires or cleeks, J, is passed. The lower part of each cleek, J, forms a long loop, at the upper part of which the wire is passed round the vertical limb of the cleek, and is then prolonged upwards as far as the pattern needles, this portion of the needle diverging gradually from the vertical part. The looped portion of each cleek rests upon a horizontal wire, K, of a brander or frame for carrying the series, the horizontal wires admitting of the free motion of the cleeks in a vertical direction. The free arm or diverging part of each cleek, J, rests against a cross wire, L, which is fitted in immediate proximity to the arm, so that when the pattern needles are pushed back by the solid parts of the cards, they are restored to their normal position on being released by the arm acting as a spring on the other portion of the cleek. This forward movement of the cleeks, when not otherwise acted upon, serves to bring the upper hooked end of each cleek over its contiguous brander slip, M, or horizontal bar of the brander, N. The ends of these brander slips are fitted into the blocks, O, which slide freely between the brander, N, and the flat steel plates, P, which extend along the upper part of the brander. The effect of this arrangement of the parts is, that as the needles, A, B, C, and D, are pushed back by the action of the cards as they are successively brought round by the Jacquard barrel, those cleeks which are thus acted upon are kept clear of the brander slips, whilst the others are raised. The cleeks, J, being raised in this manner in the predetermined sequence, the shed is thereby formed so as to produce the required figure or pattern. The twilling of the fabric is effected by means of a mechanical arrangement fitted below the pattern needles, A, B, C, and D, and it consists of a series of cams arranged upon one shaft, and acting in concert upon the extremities of the rods, Q. These rods are flat metal bars, which are supported on the end standards, R; each rod has upon its upper face two brackets, S, which serve as footsteps for the vertical rods, T. The upper ends of the rods, T, are suspended from the rail, U, by a pin, which passes through each rod, and they also pass through the blocks, O, to which the brander slips, M, are riveted. It follows, from this arrangement, that the movement of the horizontal rods, Q, is communicated to the vertical wires, T, and through them to the brander slip blocks, O, so that when the rods, Q, are pressed forward by the series of cams acting on the extremities, the vertical wires, T, move the blocks, O, up to the cleeks, and cause them to be raised by the brander slips, M; this movement of the wires, T, also carries back those cleeks which have been left forward by the pattern barrel. The motion of the rods, Q, in the opposite direction, will obviously have the effect of moving the blocks, O, and brander slips, M, clear of the cleeks, J, which consequently remain down. Provided, then, that the rods, Q, are actuated in a proper sequential order by means of the cams or twilling barrel, the cleeks will be operated in a corresponding manner, so as to produce the twilling of the figure and ground of the fabric to be woven, as predetermined. These arrangements of the parts, whilst they simplify the Jacquard mechanism, serve also to extend the means for producing more varied effects in the fabrics to be woven.

SCREW WRENCHES AND COTTERS.

James Ferrabee, *Stroud.—Patent dated December* 20, 1859.

In constructing screw wrenches or spanners according to this invention, the moveable jaw is made to slide freely on the bar or stem of the handle, and it is fixed to, or retained at, any part thereof by means of a sliding wedge, which is introduced between the back of the bar or stem and the sliding jaw. The wedge is carried by a strap from a sliding piece, which slides readily on the bar or stem, and the sliding piece can be moved to and fro thereon by means of a worm or screw carried by the sliding piece, taking into a toothed rack formed on the bar or stem. The screw or worm may be so mounted in the sliding piece, that it may readily be thrown in and out of gear with the worm, so as to be able to adjust the screw wrench or spanner with greater rapidity. In place of the sliding jaw being held by a wedge, the sliding jaw may be connected by a strap to a sliding piece carrying a worm or screw, which takes into a rack in the bar or stem. In some cases the wedge is formed with a toothed rack, and the screw or worm works in the teeth thereof, the screw or worm being carried by the moveable jaw. In constructing spanners, in addition to the use of a screw or worm, to act with a wedge so as to move the moveable jaw to and from the fixed jaw, the spanner is mounted on an axis or pin point on the stem or handle, in such manner that the spanner may be moved on such axis or pin point, and be retained in any desired position by a ratchet and catch, or other convenient means. In constructing some kinds of spanners, the patentee makes both jaws capable of moving to and from each other, each jaw being moved by a wedge or instrument and screw or worm, or both jaws of the spanner may be fixed, and each jaw fitted with sliding filling pieces by changing which the spanner may be made to embrace different sized nuts. In securing cotters a toothed rack of screw teeth is formed on the cotter or on the gibb, and a screw or worm is applied in such manner that the cotter may be set up or slackened, as may be desired, by rotating the screw or worm. Fig. 1 is a side elevation of the patentee's improved screw wrench, and fig. 2 is a back view of the same. A, is the main

Fig. 1. Fig. 2.

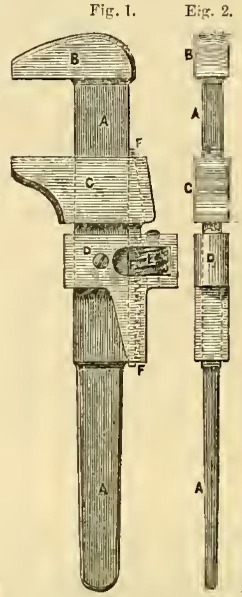
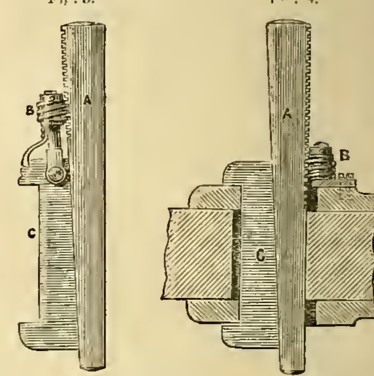


Fig. 3. Fig. 4.



bar or stem, to which the fixed jaw, B, is attached; C, is the moveable jaw, sliding on the stem, A. The piece, D, is attached to, or forms part of, the stem, A, and carries the worm, E, which works into the teeth formed on the wedge, F, which is connected to the moveable jaw. By turning the worm, E, in one direction or the other, the moveable jaw is advanced to, or separated from, the upper jaw. The teeth of the wedge, F, are protected by the piece, D, and if desirable, the teeth of the wedge may be placed towards the stem, A, and slide on it, and the worm, E, be fixed in the stem. Instead of the wedge, F, a shouldered strap may be used. Figs. 3 and 4 are modifications of improved modes of securing cotters by means of a toothed rack of screw teeth formed on the cotter or on the gibb, and by a screw or worm by which the cotter may be set up or slackened as desired, by rotating the worm or screw. In fig. 3 the screwed rack is formed on the edge of the cotter, A: the worm, B, rotates on the end of the gibb, C, to which it is jointed, and is kept in position by a spring click or detent, which takes into notches cut in the gibb. Fig. 4 shows the worm attached to a separate piece screwed to the strap, and capable of being turned round on the pin which holds it, to relieve it from the cotter. In another arrangement the worm is mounted on a separate piece, and slides on the gibb, which has teeth formed on it; the cotter itself may be made to receive the worm, which may work on teeth cut in the gibb, on a separate threaded piece.

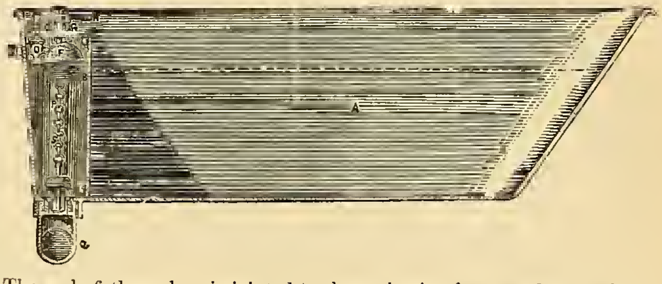
FOUNTAINS, BATHS, AND VALVULAR APPARATUS.

Walter Macfarlane, *Glasgow.—Patent dated Oct.* 6, 1859.

In the drawings accompanying the specifications of these letters patent, Mr. Macfarlane has shown a very elegant design for a drinking fountain, which has been specially designed with a view of harmonizing with the character of the material employed, namely, cast iron, so as to present a light and elegant appearance to the eye, combined with elaborate decorative details. The rectangular base of the fountain rests upon a substructure or foundation of masonry, and at the angles of the base there are placed four light-fluted columns. Springing from the capitals of the columns is a decorated arch, which unites the columns on the four sides of the structure, and through the openings thus formed the fountain is seen. Extending round the arch is a cable moulding, which also encloses a circular space adapted for receiving armorial bearings, medallions, or other appropriate devices. The cornice is carried round the upper part of the cable moulding, and extends away on each side in a lateral direction, the overhanging parts above the spring of the arches being supported by enriched cousoles. The upper part of the fountain above the cornice is enclosed by a cupola of decorative openwork, surmounted by an elegant openwork finial; the spaces between the arched portions of the cornice are filled in with griffins. Within the space enclosed by this ornamental structure is arranged the fountain from which the supply of drinking water is obtained. The fountain, consists of a decorated columnar pedestal, which is cast hollow, and rests upon a sunk part of the base. The floor of the base extends away from the lower part of the pedestal over to the outer part, serving as a receptacle to receive water, and form a drinking trough for dogs. The upper part of the pedestal is cast of a concave figure to receive and correspond to the external central part of the tazza or basin. This portion of the fountain is cast with an enriched marginal moulding, and incised decorative figures covering its internal surface. The basin is attached to the pedestal by means of malleable iron bolts, which are fixed in the upper part of the pedestal, and project out through the bottom of the basin. The bolts serve also as attachments for the upper part of the fountain, which is so fitted that its lower edge is slightly raised above the surface of the basin. The water which falls into the basin thus flows beneath the edge of the upper part, and through an aperture left in the centre of the basin, passing down the hollow pedestal, and out through apertures which are made in the ornamental figures near the base of the pedestal. Just below the lateral openings a metal diaphragm is fixed across the interior of the pedestal, for the purpose of stopping the further downward flow of the water. The upper part of the fountain is highly enriched with decorative work externally; it is furnished with four lateral openings, through which the supply of water issues. Above this part the ironwork forms an ornamental base, decorated with the foliage of the arum, or rose, thistle, and shamrock, and terminating in the figure of a pelican or other suitable emblematical device. The water supply is derived from a vertical pipe, the lower extremity of which is connected with the street main. This pipe rises through the stuffing-box in the diaphragm, and thence upwards through the upper part, where it branches off quadrilaterally in the direction of the openings provided for the emission of the water. To the extremities of the four-branched pipe are fitted the valvular arrangements, which serve to regulate the flow of the water. The water is obtained by simply pressing the edge of the drinking cup against a laterally projecting button just below the outlet aperture. There are four of these drinking cups which are suspended by chains to the lower part of the ornamental canopy. These cups are, by preference, of an elliptical bowl shaped figure, as being more convenient for use. Behind the button is a short helical spring, the pressure of which against the button tends to keep it outwards, unless otherwise acted upon. When the drinking cup is pressed against the button or other projecting part the spring is compressed, and the valve moved away from the seating. The water from the supply pipe passes into the central chamber of the pedestal, and being checked by the diaphragm, flows up the curved outlet pipe, which is fitted so as to coincide with the emissive openings in the upper part of the fountain. In this manner the operation of obtaining water from the fountain is performed by a simple motion of one hand, at the same time, unnecessary waste of the water is avoided by the valvular passage closing automatically on the withdrawal of the drinking cup from the button or projecting part. In another modification of the valvular apparatus, the flow of water is obtained by a slight upward pressure on a projecting lever. This lever corresponds in its office to the projecting button; it passes out through a slot made in a small plunger, which works up and down in the lower part of the valvular shell. Upon the edge of the drinking cup being placed under the end of the lever, which is slightly hooked, and an upward pressure exerted, the water flows through the outlet pipe into the drinking vessel, the pressure of the water on the valve causing it to shut when the cup is removed. These valvular arrangements may be readily modified, so as to cause the water to flow, either by a downward pressure or an outward drawing motion, with the edge of the drinking cup, in lieu of the inward and upward pressing motions herein before described. The water used for rinsing the drinking cups and the overplus flows down the pedestal and into the trough, the surplus water passing through a grating, and away by a waste pipe to the sewer. Public drinking fountains arranged according to these improvements combine elegance of design with a gracefulness of outline which render them a peculiarly ornamental adjunct to the streets of a city. At the same time the utility of these structures is increased by the simplifying the modes of obtaining the water.

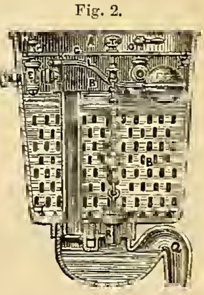
Fig. 1 of the subjoined illustrations is an elevation, partially in section, of one arrangement of the patentee's improved bath, having the water supply and discharge apparatus fitted therein; fig. 2 is a transverse vertical section taken through the end in which the supply and discharge apparatus is fitted. The bath, A, is formed of metal or other suitable material, the inner surface of which may be covered with enamel or paint. Preference is given to cast-iron as the best material for the baths; they are cast in one piece rounded and sloping at the upper or shoulder end. Within a short distance of the foot or lower end of the bath is a vertical division plate, B, and cover, C, which enclose the space between the plate, B, and the end of the bath. Within the space thus enclosed is fitted the valvular apparatus for supplying water to the bath, as well as for regulating its height in the bath and its discharge therefrom. This bath is so arranged that its fittings, complete, are in one piece with the bath, so that in fixing it at its site no other attachment is required than simply to connect its inlet pipe with the water main, or if hot water is also required, to connect its supply tap with the source of supply. A branch from the ordinary water main is soldered to the inlet, D, to which is connected the valvular apparatus, E, the action of which is controlled by the ball float, F, and by the tap, G. The shell or horizontal tubular portion, E, has fitted in it the vertical tap, G, which is furnished with the handle, H, which admits of the water being turned off irrespective of the float, F. To the shell, E, is attached the outlet portion of the apparatus; this part is of a T-shaped figure; a contraction of the internal part, just below the horizontal waterway, forms the valve seating. In the upper part of the tubular passage a small plunger, K, works; through the slot in this plunger the rod, L, of the ball float, F, works.

Fig. 1.



The end of the rod, L, is jointed to the projecting lugs on the exterior of the outlet part, so that the rising and falling motion of the ball float actuates the plunger, K. The lower face of the plunger has screwed into it the upper end of the valve spindle, an inverted cupped leather being interposed between the plunger and the flange of the spindle. The lower end of the spindle carries a valve, the upward motion of which closes the waterway. When the bath is required for use, the cock, G, is turned on, and the ball float, F, being down, the water flows into the enclosed space and through the perforations in the division plate, B, into the bath; as the water approaches the predetermined height the float is gradually raised, and when it has quite reached this height the further flow is stopped by the closure of the valvular passage. If the bath is furnished with a hot, as well as a cold water supply, the hot water pipe is connected to the inlet of the tap, O, the quantity thus admitted being regulated by hand. In the compartment behind the division plate, B, is fitted the vertical waste pipe, P, which prevents the further rise of the water when the body is immersed therein. The lower extremity of this waste pipe passes through the bottom of the bath and fits into the siphon trap, Q, which is arranged below the bath, and communicates with the drain or other outlet for the waste water. The arrangement of this trap prevents the admission of any draft or offensive vapour rising up from the drain; a second opening in the bottom of the bath is made to communicate with the siphon trap, Q, which opening is closed by means of the valve, R. This valve is raised by the chain, S, or other connection, which is attached to the spindle of the handle, T. A projecting part on the spindle of the handle admits of its being suspended on the cover, C, when partially turned, round so as to keep the valve, R, raised, when the water in the bath is required to be run off after using it. With these improvements the filling and discharge of the contents of the bath are reduced to the most simple conditions, involving no trouble whatever. These improvements are also specially applicable to "hip baths," in which the whole of the arrangements for the supply of the cold and hot water, as well as the discharge apparatus, are contained within a small box or compartment at the back of the bath, the taps and valve handles being within convenient proximity to the bather. The ball float apparatus for regulating the flow of the water may also be arranged in either of the following ways, so as to dispense with the secondary cock or valvular apparatus for turning the water on or off, irrespective of the automatic action of the float. Under one modification the small plunger, K, shown in fig. 2 of the accompanying engravings, has projecting outwards, in a lateral direction, two pins, one on each side of the plunger. These pins serve, with the aid of a couple of links, to connect the plunger to a bent lever handle arranged above the cover, C. The lower part of the lever handle is bent at right angles to the other portion, and at this part it is centred upon a fixed stud. Whilst this lever handle is in the vertical position the plunger is free to move up and down, and the valve is actu-

Fig. 2.



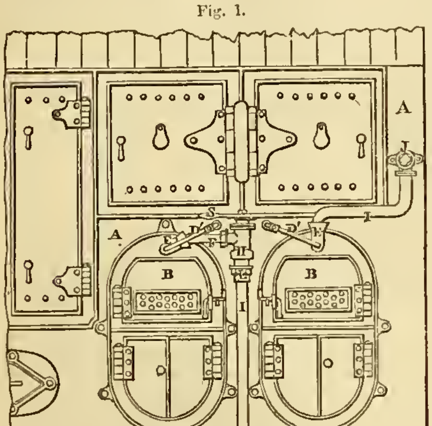
ated in the ordinary manner by the ball float; but upon turning the handle from the vertical to the horizontal position, the bent part of the lever raises the links, and these move up the plunger so as to close the waterway. This arrangement may also be modified, so as to be actuated by moving a horizontal hand lever to the vertical position, or *vice versa*. Another mode of controlling the passage of the water through the valvular apparatus is, by arranging the rod of the ball float so as to admit of a short link piece passing through it, the upper part of which projects out through the cover, c, and has a horizontal handle fitted to it. The lower part of the link piece on which the float rod rests is inclined in a downward direction to correspond to the angle of the rod, and upon turning the actuating handle above the cover, c, the inclined part of the link piece acts as a wedge to raise the float rod, and so close the waterway. These valvular arrangements are also applicable generally for controlling and regulating the flow of liquids in other situations than that of bath rooms.

GENERATING STEAM AND HEATING APPARATUS.

S. S. Bateson, *London.—Patent dated February* 22, 1860.

These improvements have reference to Mr. Bateson's former inventions, which we reported in the *Journal* for October, 1859, page 177, and for December of the same year, page 234. In carrying out the present invention, the patentee places in the interior of the "feed coil" a pipe of considerably smaller diameter than such feed coil pipe, and causes perforations or slits to be made in such internal pipe at the parts coinciding with those portions of the outer pipe or feed coil, which are in immediate or nearly immediate contact with the fire. And he connects one or both ends of the internal or perforated pipe with the water space of the boiler or steam generator, the pressure of the column of water keeping the small pipe supplied, and when steam is generated, its pressure upon the water in the boiler will force a supply of such water through the perforations or slits in the internal pipe into the feed coil at those parts where, by reason of the great heat, the water which is being circulated through such feed coil, has a tendency to assume the spheroidal state, or to become converted into steam. By these means the burning or destruction of the feed coil is entirely prevented, as a constant supply of water at a lower temperature than that in the feed coil is maintained, whilst at the same time the water in the feed coil is never brought into such a state as to prevent its flow or free passage through. In the absence of steam pressure, the supply from the inner pipe may be maintained solely by the difference in the temperature of the water in the two pipes. If found desirable, the internal perforated pipe may be kept constantly supplied with water by being connected with a tank or other convenient source of supply placed at a higher level than such internal pipe.

Fig. 1.



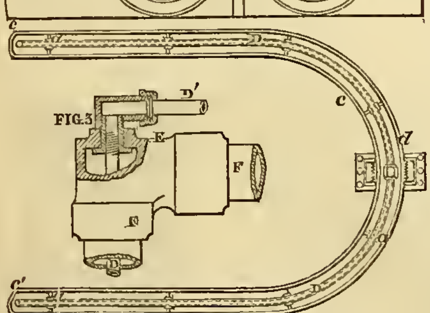


Fig. 2.

The invention is also applicable to a certain class of tubular boilers wherein the water circulates through the tubes, and the fire plays round their external surfaces. The mode of such application consisting in fitting such tubes with internal perforated or slotted tubes of smaller diameter, which are kept constantly supplied with water. The improvements may also be applied generally to all vessels employed in the heating of liquids, the mode of such application consisting in fitting lengths of circulating tubes to the vessels in such a position that they will be exposed to the action of the fire, such tubes opening at both ends into the bottom or sides of the vessel, and being provided with an inner perforated or slotted tube of smaller diameter, also opening into the vessel at one or both ends. The patentee prefers generally that the inner perforated tube is maintained in a central or nearly central position as regards the outer heating pipe or feed coil, by means of suitable guides or supports, which prevent the inner tube from coming in contact at any part with the inner sides of the outer pipe or feed coil, whereby the inner pipe is always surrounded by water. In some cases, and particularly in high-pressure engines, he prefers to have the cock or valve which leads to the tank or source of water supply so constructed, as to allow a small quantity of water, proportionate to the size of the feed, to pass at all times to the feed pump. This may be effected by cutting a groove round the plug of the cock, or by making one or more small perforations or notches in the valve. Fig. 1 of the subjoined engravings, represents a front elevation of a set of marine engine boilers, fitted with the patentee's improved feed coil or heater, and fig. 2 is a sectional plan of a portion of the coil detached, showing the portion of the internal perforated or slotted pipe. The other figures are sectional details of valves and connections. A, is a front plate of the boilers, and B, the furnaces. The feed coil, C, is secured by suitable clips or other attachments to the crown of each furnace, entering and leaving each furnace above the fire-doors, as shown, so that one coil of the form shown in fig. 2, receives the heat of two furnaces; one limb of the coil being in one furnace, and the other limb in the contiguous furnace, whilst the curved part, *d*, of the coil is contained within the flue or passage at the back of, and uniting the two furnaces. At this part the two halves of the feed coil, C, and of the internal perforated pipe, D, are secured together by union or other joints, the joint of the external pipe being properly protected from the direct action of the fire by an outer casing or covering of cast-iron. One end of the coil is connected by means of an internal screwed elbow bend, E, shown in section at fig. 3, or other suitable joint, to a branch pipe, F, which is secured to the lateral branch, G, of the supply regulating valve, H, shown in section on an enlarged scale at fig. 4, whilst the opposite end of the coil over the adjoining furnace door is similarly connected to a branch pipe, I, leading to a stop-cock, J, which opens direct into the boiler. The internal perforated pipe, D, is maintained in a proper central, or nearly central, position inside the feed coil, C, by suitable guides or supports, *a a*, fitted thereon, or upon the inner sides of the feed coil, so that the two pipes will not be in actual contact with each other. This internal perforated pipe, after traversing the entire length of the coil, is secured at each end to the two elbow bends above the fire-doors, as shown in fig. 3, where it opens into the small branch pipes, D[1], leading into the water space of the boiler. By this arrangement it follows that there will always be a supply of water inside the perforated pipe, and that such water, by reason of the pressure inside the boiler, will constantly tend to flow through the perforations into the feed coil, and keep it always supplied with water in case the feed water therein should at any time have a tendency, by reason of the intense heat, to become entirely vapourised or assume the spheroidal state, thereby impeding the regular flow of the feed water, and endangering the coil. The cold feed water enters the apparatus by the vertical pipe, K, which is connected by a union joint, L, to the bottom of the valve casing, H. M, is an ordinary clack valve, and N, a conical plug, shown in transverse section at fig 5. This plug is cast hollow, and is ground into the valve casing, and is retained therein by the plate, O, bolted to the flanges on the top of the casing. P and Q are two lateral openings made in the hollow plug, and so placed that the feed coil may be turned on or shut off, as shown at fig. 5; the branch, R, which leads direct into the boiler, being in the former case closed, so that the entire flow will take place through the feed coil, and in the latter case open, so as to direct the feed water at once into the boiler, without entering the feed coil in

Fig. 4.

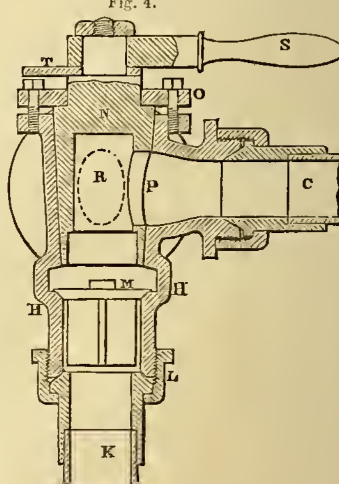
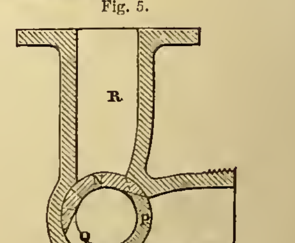


Fig. 5.



case of any accident happening thereto. If desired, the plug may be so turned as to shut off both the feed coil and the direct entrance to the boiler. S, is the handle for turning the plug, and T, is an indicator for showing the position of the valve, the surface of the plate, O, being divided for that purpose.

CAPS OR STOPPERS FOR JARS AND BOTTLES.

J. H. Johnson, *London and Glasgow* (T. R. Hartel, *Philadelphia*).—*Patent dated February* 24, 1860.

This invention relates to that class of vessels, and caps or stoppers for the same, wherein the latter are secured to the former by inclined planes on the one, and projections on the other, fitting beneath such inclines, and it consists in imparting the desired shape to the cap or to the mouth of the vessel, by first forming vertical ribs on the same, and then removing a part of each rib, whilst the material operated upon is still plastic to leave the desired projections. All this is done by one instrument, and as parts of one and the same operation.

Fig. 1 of the subjoined engravings is a sectional elevation of the apparatus for carrying out the improved method or process of forming the caps or covers of jars and other vessels; fig 2 is a sectional plan of fig. 1; fig. 3 shows the complete cap as applied to a jar; and figs. 4 and 5 illustrate the apparatus as applied to the formation of projections, in the mouth of the vessel. A, is the mould or box for receiving the molten glass or other plastic materials of which the cap, B, is formed; and C is a die, the lower end of which forms the inside of the cap. The mould is made in two halves, held together during the process of forming the cap by tongs, or other appliances of such construction to admit of the two halves of the mould to be separated when the cap has been formed, so that the latter, with any mouldings or devices which may be embossed on its outer surface, may be easily withdrawn The block or die, C, has a circular recess or chamber concentric with the exterior, and in the bottom of the chamber fits a disc, *d*, attached to or forming a part of the spindle, D, which is retained in its proper position, both laterally and vertically, by the transverse bar, E, secured to the top of the die. An arm, F, projects from the upper end of the spindle, D, serving as a handle, by which the said spindle may be turned partially round to an extent limited by pins, H, which project from the transverse bar, E. On the under side of the disc, *d*, is a recess or cam groove of the form of an equilateral triangle, with rounded corners, and into this groove fits the round projection, F, on one end of each of the radial punches, *a*, which are arranged to slide in grooves or slots formed in the bottom of the recess of the block, C, and to fit into and slide freely in orifices passing through the sides of the block or die, each punch being provided at the

Fig. 1.

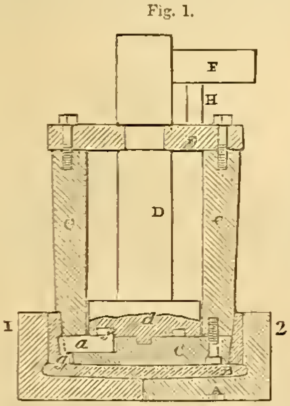
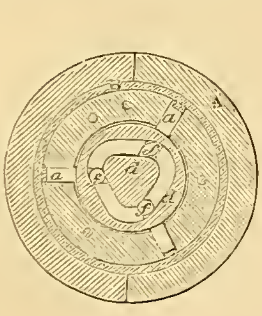


Fig. 2.



outer end with a lip, *g*, the lower end of which lip is flush with the bottom of the die. On the sides of the die, and at the parts where each of the orifices for the reception of the punches is situated, there is formed a perpendicular recess, shown in figs. 1 and 2, for a purpose which will be presently explained. When the above described apparatus is used, the mould is held in suitable tongs, so as to keep the two halves together, and the molten glass or other plastic material is deposited in the mould, A, when the die, C, (with its shaft, D, turned, so that its punches, *a*, are drawn inwards to the position shown in fig 2,) is pressed to the desired depth into the mould. A plain circular recess, with three vertical ribs, corresponding to the three vertical recesses of the die, is thus formed in the plastic substance. Prior to withdrawing the die, however, and while the material in the mould retains its soft or plastic state, the operator turns the spindle, D, by means of the handle, F, until the latter is moved from one projection, H, to the other. By this movement of the spindle the three radial punches, *a*, are projected outwards simultaneously, their ends being thereby forced against the ribs previously alluded to, as having been formed in the plastic material by the vertical recesses on the side of the die. Indentations will thus be made in the whole of the ribs simultaneously, leaving the portion of each rib projecting near the edge of the cap. The spindle, D, is then turned to its former position, the punches being thereby simultaneously withdrawn from the indentations which they had formed in the ribs made by the vertical recesses of the die when the latteris raised from the mould, which is opened so that the completed cap may now be removed. The vessel to which the cap is to be applied is represented in fig. 3; it has formed upon it near the edge of its mouth, the inclined planes, *y*, so that on applying the cap, it is slipped over the mouth of the vessel in such a position, that each of the projections coincides with the space between two of the inclined planes, *y*, after which the cap is turned round, so that each of the projections shall catch the under edge of the

Fig. 3.

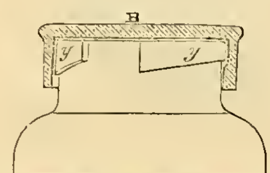


Fig. 4.

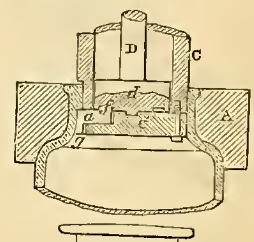


Fig. 5.

inclined planes, and on continuing to turn the cap it will be brought to bear tight upon the edge of the mouth. When a perfectly air-tight joint is required, the die forms in the interior of the cap a recess to receive a ring of gum elastic, or other suitable material, which fits on the edge of the mouth of the vessel; when the cap is applied to the latter it forms the desired air-tight joint. In some kinds of vessels it may be necessary to grind the ends of the projections, which bear against the inclined planes, *y*, so that they may be perfectly smooth and true with each other, as well as with the said planes. This grinding operation may be conveniently performed as follows. The spindle, D, of the block or die is secured to the spindle of the back headstock of an ordinary lathe, and the cap, B, is "chucked" to the face plate of the front headstock. Suitable grinding material is applied to the inside of the cap, and the cap is caused to revolve; the end of the die, which, when applied to this purpose is slightly smaller in diameter than that by which the interior of the cap was formed, is gradually brought to bear on the bottom of the cap, and through the action of the grinding material, is soon reduced to an uniform level surface. The die is then turned partially round, which motion, as the spindle remains stationary, serves to project the punches outwards, and the grinding material which adheres to the projecting ends soon reduces the ends of the projections, *x*, to an uniform surface, which must, of necessity, be parallel to the previously ground surface on the bottom of the cap. It will be evident that a cap with more than three projections may be formed by this process, all that is necessary, being to increase the number of punches, *a*, and to alter the form of the recess or cam groove in the disc, *d*, to suit the number of punches and projections. For the larger class of caps the grooved disc may be dispensed with, and a simple plate or boss may be attached to the end of the spindle, D, the plate being so connected by rods, *h*, to the punches, *a*, that on turning the spindle partially round, the whole of the said punches will be projected outwards or withdrawn simultaneously. Fig. 4 illustrates the mode of forming projections on the inside of the mouth of a vessel, the inclined planes being on the cap, as shown in fig. 5. A, are the two halves of a mould, formed so as to inclose the mouth of the vessel. While the latter is in a soft or plastic state, the die, C, which is similar in construction to that above described, is inserted into the mouth, thereby forming vertical ribs, which, by the turning of the spindle, D, and the projection of the punches, are indented as described above, leaving projections adapted to the inclined planes on the cap.

CHURNING AND WASHING MACHINES.

John Patterson, *Beverley.—Patent dated April* 17, 1860.

Mr. Patterson's improved churn or washing machine—for the apparatus is applicable to both purposes—consists of a tub or vessel of any suitable shape, which is mounted in such a manner that it may be rotated round a fixed centre, but without, at the same time, turning on it own axis. The milk, or the washing liquid contained therein is, by this peculiar motion, instantly agitated, and caused to rush or flow round about the vessel, thereby producing the required agitation necessary in the process of churning, or of washing.

Fig. 1 of the accompanying engravings represents a vertical section of one form of the apparatus, as applied to the churning of milk or cream. A, is the vessel for containing the milk or cream; it is provided internally with a number of dashers, *a*, secured to its sides. B, is the lid or cover; and C, are two handles fixed to the outside of the vessel. D, is

Fig. 1.

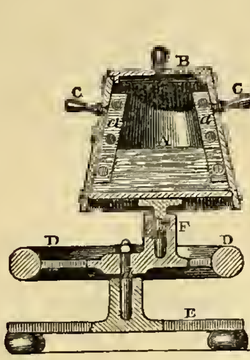
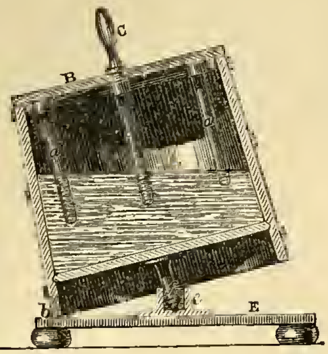


Fig. 2



a horizontal wheel, which answers the double purpose of a fly wheel and crank. It is provided at its centre with a stud-pin, *d*, which works in a footstep-bearing, on the platform or support, E. F, is a boss or footstep formed upon the face of the wheel, D, in which boss or footstep works the stud-pin, *f*, secured to the bottom of the vessel, A. If the vessel be filled up to about the height shown in the figure with cream or milk, and the handles, C, be grasped so as to prevent the vessel from turning on its own axis, whilst at the time it is caused to rotate or describe a circle round the centre or axis of the wheel, D, a violent motion of the cream or milk round the inside of the vessel, A, will be produced, which will effectually churn it into butter. The remaining liquid may then be run off by a tap or plug hole at the bottom, in the ordinary manner. Fig. 2 represents another form of the apparatus as adapted to the washing of clothes, although it is also applicable as a churn. In this modification the tub or vessel, A, has an angular, rolling, or gyratory motion. It is provided at its under side with a stud-pin, *f*, which works in a footstep, *e*, on the platform, E. This pin, *f*, is made of such a length as to cause the tub or vessel, A, to lean considerably over a portion of its lower edge or bottom resting upon the surface of the platform. By taking hold of the handle, C, in the lid or cover, B, and moving it in a circle horizontally, the tub or vessel, A, will roll round or gyrate with its lower edge, b^1, upon the platform. The interior of the vessel, A, in fig. 2, is arranged for a washing machine, the dashers, *a*, in fig. 1, being replaced by pegs or pins, *a*, fixed into the lid, B, and projecting downwards to within a few inches of the bottom, these pins serving to prevent the clothes from being carried round with the violent flow of the fluid or water. When used as a churn, dashers similar to those shown in fig. 1 may be fitted inside the vessel, A, the pins, *a*, in that case being dispensed with.

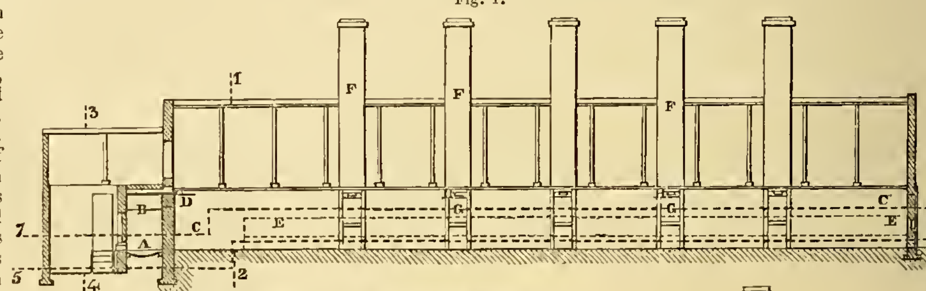
DRYING BRICKS.

JOEL SPILLER, *Cardiff.—Patent dated December* 9, 1859.

This invention relates to improvements in drying houses, and to the application of heated gaseous matter, known as "products of combustion," mixed with pure atmospheric air, for drying articles formed of plastic clay, and consists of certain means which the patentee employs or combines to produce a downward current of heated air on the articles to be dried. The articles requiring to be dried are placed or stacked upon the floor of a closed building or enclosed shed; this floor has a number of openings made in it, which communicate with flues or passages below it, and the passages communicate with vertical flues or chimnies formed in the side or end walls of the building or outside of it. The articles to be dried are thus subjected to a dry gaseous downward current absorbing and carrying away their watery particles, and so producing the desired effect.

Fig. 1 of the engravings represents a longitudinal section of one arrangement of the improved drying house, with its furnace and internal fittings, which are more particularly adapted for the drying of bricks; fig. 2 is a transverse section of the part containing the furnace and air passages; fig. 3 is a horizontal section of a double house, each house being divided by a wall down the middle, so as to form two compartments. A, is the furnace with fire bars, fire doors, and ash-pit of the ordinary kind; B, the passages for enabling the atmospheric air to mix with the products of combustion, the passage over the furnace door being filled in with earthenware drain pipes or grating to prevent regurgitation; C, is the drying chambers; D, sheet-iron doors or dampers to shut off or regulate the quantity of heated air and gaseous products going into the chambers; E, the double stage fittings to receive the bricks to be dried; F, vents for the escape of air and vapour from the chambers; G, wooden sliding doors for closing and regulating the area of the passages into the vents; H, small openings into the vents near the ceiling with slides for closing them; I, doors communicating with the passages between the stages for the introduction of the bricks to be dried; J, other doors for discharging the bricks when dry. Each house contains two distinct chambers or compartments bounded by the side walls, windows, doors, and ceilings, so that when the doors, I and J, the wooden sliding doors, G, the small openings, H, and the sheet-iron doors, D, are all closed, each chamber or compartment is separate from the other and entirely enclosed. If now the upper and lower stages be charged with newly moulded or wet bricks, and the sheet-iron doors, D, and sliding doors, G, be opened, and a fire is lighted in the furnace, all the heated gaseous products formed by the combustion of the fuel will ascend with sufficient power to cause pure atmospheric air to enter the passages, B, mix with such products and pass through the sheet-iron doors, D, forcing an equal volume of the air in the chambers or compartments into and up the vents, F. The heated air thus entering diffuses itself uniformly, or nearly so, throughout the entire length and breadth of the compartments, in a short time filling them from the ceilings to the floors and passing through the sliding doors, G, into the vents, F, will cause these vents to act as chimnies, and thereby increase the draught or give additional velocity to the air passing through the compartments, furnace, and air passages. The small openings, H, are for the purpose of assisting the motion of the air through the compartments at the commencement of the drying process, more particularly in some states of the weather, but so soon as the air current is well established these openings are to be closed in order to prevent loss of heat. When such a drying house is in action there is in each chamber or compartment a current of warm air constantly descending, and from the situation of the bricks on the stages the descending current comes in contact with and communicates heat to them; the heat so communicated produces the evaporation of the water

Fig. 1.



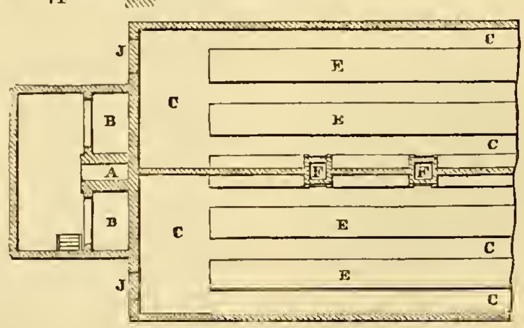


Fig. 2.

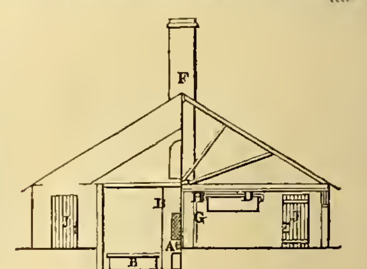
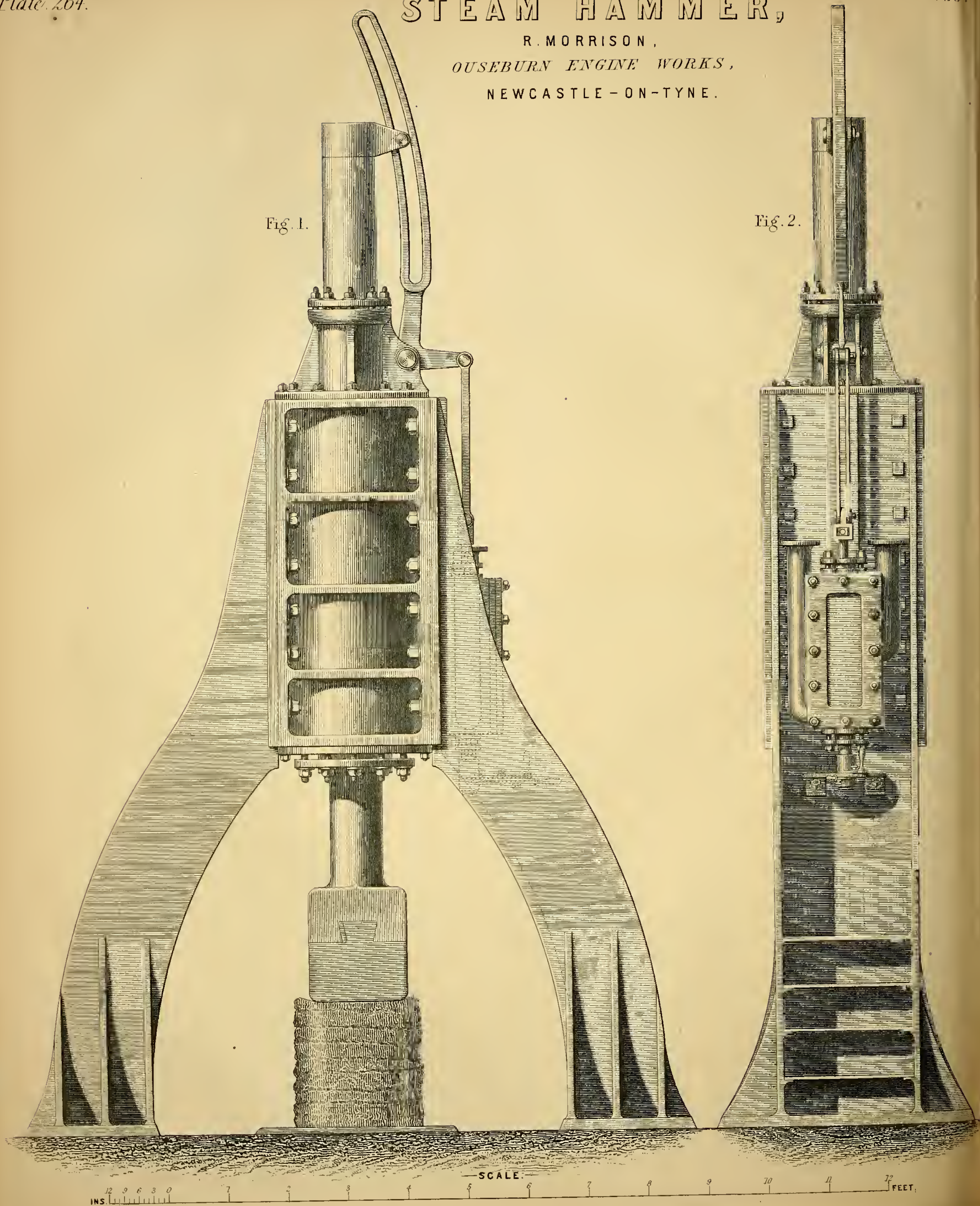


Fig. 3.

Plate 264.

STEAM HAMMER,

R. MORRISON,
OUSEBURN ENGINE WORKS,
NEWCASTLE-ON-TYNE.



contained in them. The vapour thus produced mixes with, or is absorbed by, the surrounding air, and by the constant influx of dry warm air into the compartments, the air so mixed or charged passes into the vents and is discharged. Bricks submitted to this process are quickly dried. The patentee finds, however, by experience that the heat of the furnace must be so moderated as to allow bricks of the ordinary size from thirty-six to forty-eight hours to dry, for if dried more rapidly they are liable to crack. The time required depends in a great measure on the quality of the clay of which they are made. The reason for preferring two houses placed side by side rather than one equal to the length of the two combined, and also for dividing each house into two chambers or compartments, is to effect greater economy of drying space. It will be seen that by the doors, D, and the slides, G, the chambers or compartments may be worked either separately or conjointly, each receiving at any time its supply of wet bricks independently of the other, so that by thus dividing the drying space three out of four of the chambers or compartments may be kept in constant action. The patentee prefers coke as fuel for the furnaces, but any other fuel which emits little or no smoke will answer the purpose.

FURNACE BARS.

John Blackwood, *Banff.—Patent dated March* 21, 1860.

Mr. Blackwood's improved furnace bar is by preference cast of an elliptical or egg-shaped figure, with an opening extending longitudinally through it The result of this arrangement is, that these furnace bars last five times as long as those of the ordinary kind, whilst the action of the furnace itself is greatly improved in consequence of the introduction thereto of a body of air which has been previously heated in passing through the bars. These bars may, if preferred, be made with the upper surface flat, but preference is given to the convex figure. The bars are adapted for the furnaces of stationary, locomotive, or marine engines, without requiring any alteration in the internal arrangement of the same. Fig. 1 of the accompanying engravings is a partially sectional elevation of one modification of the improved furnace bar, and

Fig 1.

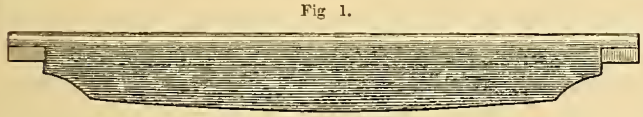
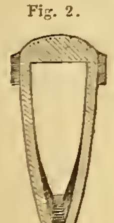


fig. 2 is a transverse vertical section of the same. The furnace bar is cast or rolled hollow, that is to say, it has an opening extending longitudinally throughout its length. The external portion of the bar is by preference formed of an elliptical or egg-shaped figure as shown in fig. 2. The wider portion of the egg-shaped figure forms the upper part of the bar, and the fuel rests upon the rounded upper surface, when the bar is fitted in the furnace. The ends of the bar are notched or recessed in the ordinary manner, to admit of the bar resting on the cross-bearer or supporters which are fitted at each end of the furnace, and there are the usual laterally projecting parts, which preserve the necessary longitudinal openings between the fuel bearing portions of the bar. Below the bearing ends of the bar the metal is curved so as to leave a good opening at each end for the admission of air. When fitted in the furnace, these openings admit of a current of air passing through each bar, and these currents of air are highly beneficial as regards the preservation of the bar. For by this means a large proportion of the intense heat imparted to the bar by the burning fuel is carried away, and its destructive effect upon the iron is counteracted by the cooling influence of the air flowing through the bar. In fitting these bars in furnaces for

Fig. 2.



stationary engines the brickwork is constructed in the ordinary manner, the bars rest upon the dead plate at the front ends, and at the back on a hollow bearer. This bearer is built into the brickwork which forms the back part of the ash pit and the fire bridge. The hollow bearer extends across the furnace, and has opening into it at each side a pipe, which is carried upwards in an angular direction, the extremity of each pipe terminating in the furnace above the fire bars. The air which flows through the hollow bars being heated in its passage, passes into the chamber or hollow bearer, and flows from it into the longitudinal pipes. The heated air issues from the pipes, where it mingles with the smoke arising from the burning fuel, where its presence serves to render inflammable the greater portion of the evolved gaseous matters, which are thus flashed into flame and utilised by imparting heat to the boiler. The flame and gaseous current after passing round the boiler are conveyed into the chimney. Instead of the foregoing arrangement, the heated air from the side pipes or from the hollow bearer may be allowed to escape, either behind the fire bridge, or be carried by means of a short pipe up through it, so as to ignite the combustible gases at the backward part of the furnace before they are allowed to escape to the chimney. By this mode of arranging and constructing furnace bars a large body of air is carried into the furnace, which serves in the first place to preserve the furnace bars, and secondly, to economise the consumption of fuel by not reducing the temperature of the furnace, and thus preventing, or nearly so, the escape of visible smoke from the chimney.

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STEAM HAMMER FOR PUDDLING.

By Mr. R. Morrison, *Ouseburn Engine Works, Newcastle-upon-Tyne.*

(Illustrated by Plate 264.*)*

The introduction of the steam hammer has done almost as much for the extension of our manufactures in wrought iron, as the steam engine has effected for the cast-iron trade. These highly important tools now form an indispensable feature in the working stock of the engineer. For as the utility of the steam hammer became developed, the manufacturers of the tool studied to produce it under various modifications, each adapted for a particular kind of work, or for some special purpose. And thus the engineer can now select from the many forms in which the hammers are constructed, the arrangement best suited to the kind of work he desires to accomplish with it. Foremost among those who have devoted skill and capital to the construction and improvement of the steam-hammer, is the gentleman whose name stands at the head of this article. The figures on plate 264 represent one of Mr. Morrison's most recent modifications of a steam hammer, adapted for puddling iron and other generally similar purposes. Fig. 1 is a front elevation of the hammer, and fig. 2 is an end or side view corresponding to the right hand side of fig. 1. The framing of the hammer consists of two vertical standards, which spring from the ground or soleplate, and form a graceful curve or sweep, extending to the upper extremity of the cylinder The opening between the standards is of an elliptical figure, resembling a gothic arch, in the centre of which and level with the ground is the anvil on which the puddle ball or "bloom" is placed. Between the standards is arranged the steam cylinder, the exterior of which on the opposite sides is cast with a rectangularly shaped flange, the opposite vertical sides of which are strengthened by transverse ribs. The cylinder is attached to the standards by bolts which pass through corresponding flanges on the standards, and are secured in the usual way by nuts. A peculiar feature in Mr. Morrison's steam hammers is the heavy hammer bar which forms the piston rod of the engine. This hammer bar has forged upon it at the centre of its length the piston, which works in the cylinder in the usual way. The upper portion of the hammer bar passes out through a deep stuffing-box formed on the top cover of the cylinder, and which serves as a tubular guide for that portion of the bar which extends out beyond the stuffing-box. The lower part of the hammer bar passes out through the stuffing-box in the lower cover of the cylinder. The lower end of the hammer bar is enlarged and forged to a rectangular figure, which part is grooved on its face, to receive the dovetail attachment of the steel-faced hammer thereto. This arrangement admits of the ready application of a new hammer face to the hammer bar, when a new one is required. To the upper end of the hammer bar is fitted a collar with duplex lateral projections, which extend over the inner limb of a curved link, arranged contiguous to the hammer bar. The collar on the hammer bar carries in its projecting parts a stud, on which is an antifriction roller that works up and down in the curved slot of the segmental link. The lower part of this link forms a bell-crank lever, which is centred on a stud carried in two laterally projecting feathers cast on the cylinder cover. The free horizontal extremity of the bell-crank lever is connected by a pair of links to a buckle on the valve spindle, the valve chest being arranged between the projecting faces of the standards. The steam pipe and exhaust are arranged parallel with the valve casing, as shown in fig. 2. Mr. Morrison uses cylindrical valves, with the edges for the admission and egress of the steam disposed in the form of a screw or helix on the surface. The ports in the cylindrical ease being likewise so spirally disposed, with a corresponding pitch, that the moving of the valve round in its case, will cause the edges for the inlet and egress of the steam to advauce or recede respectively with those ports on the valve ease, and produce the same results as though they were actually lifted and depressed without turning. One modification of these helically actuated valves will be found delineated at page 178 of the present volume. In the present modification, the motion of the hammer-bar is regulated by one cylindrical valve; in this case, the steam is always admitted alternately above and below the piston, and the part of the stroke where this change is made depends on the relative height of the covering part of the valve compared with the ports. The passages and valve are both portions of screws of equal pitches, and by making the covering part of the valve wider than the openings, and turning the valve on its axis, these parts will rise and fall relative to the ports. The cylindrical case for the slide has its ports likewise spirally disposed, and of corresponding pitch to the valve; and there is a socket which works round the valve spindle, the top part of this socket being a portion of a screw, and made to fit another part of a screw in the valve, so that by turning this socket, the valve can either be jammed fast against the collar on the spindle, or allowed to be loose thereon. This allows the valve to remain stationary during a portion of the stroke of the hammer-bar, thereby increasing its stroke by allowing the steam to be acting both above and below during a longer portion of its travel. The vertical handle below the valve easing is for turning the socket and regulating the amount of slack or play of the valve, and the horizontal hand lever is for turning round the valve and spindle, its connection above by means of a buckle to the duplex links admitting of this. Steps are fitted at the lower part of the standard below the valve casing, to admit of the operating attendant standing thereon. The whole of the gearing is thus kept clear of the front and back of the hammer, so that heavy forgings may be swung by means of a crane close up to the hammer without the possibility of the chain interfering with the working details of the hammer.

LAW REPORTS OF PATENT CASES.

Manufacture of Paraffine and Paraffine Oil from Bituminous Coals.—Infringement.—E. W. Binney & Co., *v.* The Clydesdale Chemical Company.—This was an action, tried before the Lord-President of the Court of Session in Scotland, and a jury, in Edinburgh, on the 1st, 2d, 3d, 5th, and 6th of November, for an alleged infringement of the very important patent granted to Mr. James Young, for Scotland, on the 7th day of October, 1850, for "Improvements in the treatment of certain bituminous mineral substances, and in obtaining products therefrom." The plaintiffs, or in the Scotch phraseology, the pursuers, and Mr. Young, the celebrated inventor of the process for the manufacture of paraffine and paraffine oil, from bituminous coals, and his partners, who carry on the manufacture at Bathgate, N.B.; and the defendants, the Clydesdale Chemical Company, are described in the proceedings as being, in fact, only one person, Mr. John Bain, of Morriston, near Glasgow, but carrying on business under the style of the Clydesdale Chemical Company, at Camlachie, near Glasgow. This trial, from the magnitude of the interests involved, excited great interest, and extended over six days. The Lord-Advocate of Scotland, Mr. E. S. Gordon, Mr. A. R. Clark, Mr. A. B. Shand, and Mr. Nevay, instructed by Messrs. Horne & Rose, W.S., Edinburgh, assisted by Mr J. Henry Johnson, of Lincoln's Inn Fields and Glasgow, were counsel for the plaintiffs; and Mr. George Young, Mr. D. Mackenzie, and Mr. H. H. Lancaster, instructed by Messrs. Wright & Macnaughton, W.S, Edinburgh, were counsel for the defendants. Nearly every chemist of any eminence in the United Kingdom was engaged as a witness on the one side or the other. The scientific witnesses for the plaintiffs, included Dr. Hofmann, of the Royal College of Chemistry; Dr. Lyon Playfair; Dr. Stenhouse; Dr. Odling; Sir Robert Kane, of Dublin; Dr. Richardson, of Newcastle; Professor Calvert, and Dr Angus Smith, of Manchester; Dr. Penny, and Professor Anderson, of Glasgow; Dr. Fyfe, of Aberdeen; Dr. R D. Thomson; Dr. Letheby; Dr. A. P. Price, and Mr. T. W. Keats, of London; whilst the witnesses for the defendants included Professor Brande, Mr. Dugald Campbell, Dr. Alfred S. Taylor, Mr. Warrington, and Professor Frankland, all of London.

The specification of Mr. Young's patent describes his invention as consisting in treating bituminous coals in such manner as to obtain therefrom an oil containing paraffine, which he called paraffine oil, and from which oil he obtained paraffine The coals deemed to be best fitted for this purpose are parrot coal, cannel coal, and gas coal, and which are much used in the manufacture of gas for the purpose of illumination, because they yield upon distillation at a high temperature, olefiant and other highly illuminating gases in considerable quantity. The process is as follows:—The coals are to be broken into small pieces of about the size of a hen's egg, or less, for the purpose of facilitating the operation. The coal is then to be put into a common gas retort, to which is attached a worm pipe passing through a refrigerator, and kept at a temperature of about 55 degrees of Fahrenheit's thermometer, by a stream of cold water. The temperature of the refrigerator should not be made too low, lest the product of the distillation should congeal and stop up the pipe, and a temperature of about 55 degrees Fahrenheit is sufficient. The retort, being closed in the usual manner, is then to be gradually heat. d up to a low red heat, at which it is to be kept until volatile products cease to come off; care must be taken to keep the temperature of the retort from rising above that of a low red heat so as to prevent as much as possible the desired products of the process being converted into permanent gas. The coke or residue is then to be withdrawn from the retort, which, being allowed to cool down below a visible red heat (to prevent waste of the fresh material to be introduced), may be again charged with a quantity of coals to be treated in like manner. The crude paraffine oil, distilled or driven off from the coals as a vapour, will be condensed into a liquid in passing through the cold worm pipe, from which it will fall into a vessel which must be provided to receive it. In every case, the whole of the paraffine oil to be obtained from the coal is preferred to be distilled or drawn off. The crude product of this process is an oil containing paraffine, called paraffine oil. This oil will sometimes, upon cooling to a temperature of about 40 degrees Fahrenheit, deposit paraffine. Mr. Young then went on to state that other arrangements of apparatus might be used for subjecting coals to the process for obtaining paraffine oil therefrom, as described, but the apparatus above mentioned he preferred as being well known and easily managed. But in order to obtain the largest quantity of crude paraffine oil from coals, by means of this process, and produce the smallest quantity of permanent gas by the action of the heat employed, whatever may be the apparatus used, care must be taken to heat the coals gradually, and to apply the lowest temperature necessary to complete the operation. During the distillation or driving off, a permanent gas will be produced, and this gas may either be collected or suffered to escape, as may be thought expedient. Mr. Young afterwards described in his specification, a mode of purifying the crude oil, which, however, he laid no claim to, as of his invention; his claim being the obtaining of paraffine oil, or an oil containing paraffine, and paraffine from bituminous coals, by treating them in the manner described.

The pleadings in the action extend to upwards of thirty pages of printed matter, and the defendants alleged that the specification was uncertain—that the specification did not distinguish between what was new and what was old—that Mr. Young was not the first inventor of the invention—and that the manufacture was not a new invention—that the invention was previously well known to chemists, and was described by Sir R. Kane's *Elements of Chemistry* in 1841 and 1849; Mitscherlich's *Practical and Experimental Chemistry* in 1838; Booth and Morfit's *Encyclopædia of Chemistry*, 1850; Dumas' *Traité de Chimie*, 1835; Brande's *Dictionary of Science, Literature, and Art*, 1842; Brande's *Manual of Chemistry*, 1848; Turner's *Elements of Chemistry*, 1834; *Annales de Chimie et de Physique*, 1832; Schweigger's *Neues Jahrbuch der Chemie und Physik*, 1833; Poggendorf's *Annalen der Physik und Chemie*, 1832; Erdmann and Schweigger's *Journal für Praktische Chemie*, 1834; *Traité de Chimie*, by J. J. Berzelius, 1832; Graham's *Elements of Chemistry*, 1842; and the *Encyclopædia Britannica*, 1797; and that the invention was also disclosed in the specifications of various letters patent, the first being a patent granted to the Earl of Dundonald, in 1781, for "a method of extracting or making tar, pitch, essential oils, volatile alkali, mineral acids, salts, and cinders, from pit coal;" the second, a patent granted to Jean Baptiste Mollerat, dated 2d May, 1837, for "improvements in the manufacture of gas for illumination." As, however, the defence on the ground of this patent was substantially abandoned, we shall not further refer to M. Mollerat's invention. Thirdly, a patent granted on the 4th September, 1841, to Thophil Anton Wilhelm, Count de Hompesch, for "improvements in obtaining oils and other products from bituminous matters, and in purifying and rectifying oils obtained from such matters." Fourthly, a patent granted to Mons. Du Buisson, on the 23 l June, 1845, for "new or improved methods for the distillation of bituminous schistus, and other bituminous substances.

The defendants afterwards set out the specifications of letters patent granted to William Brown on the 13th January, 1853, and to A. E. J. Bellford on the 22d August, 1853, both of which patents belonged to the Clydesdale Chemical Company, and in the use of these two patents, and more particularly of the latter, Bellford's, consisted the infringement complained of.

The defendants also pleaded that their manufacture, as carried on according to Bellford's patent, was substantially different to Mr. Young's; that the discovery of the Torbanehill mineral alone gave value to the plaintiffs' process; that the process claimed by Mr. Young was used or published near Culross, in Perthshire; at the Broseley Works, Coalbrookdale, near Weymouth, in the year 1850; and at Wareham, in Dorsetshire, commenced on about 1848; and, finally, that Mr. Young's processes of purification were not new, but were in use at many works prior to 1850. These pleadings appear to have gone on for about three years, until the following issues were finally issued:—1. Whether, between the month of July, 1855, and 13th March, 1858, and during the currency of the said letters patent, the defenders, or any of them, did, at their works at or near Cambuslang, in the county of Lanark, wrongfully, and in contravention of the said letters patent, use the invention described in the said letters patent and specification? or, 2. Whether the invention described in the said letters patent and specification is not the original invention of the said James Young? 3. Whether the invention described in the said letters patent and specification was known and publicly used within the United Kingdom prior to the date of the said letters patent?

Before proceeding to give the evidence adduced, we will state the contents of the several alleged prior publications in printed books, and in specifications of patents, and, before doing so, it will probably be useful to give a short statement as to the first discovery of paraffine.

Paraffine was discovered by Dr. Reichenbach about the year 1829, and about the same period by Dr. Christison, who read a notice of his newly-discovered substance, which he called petroline, before the Royal Society of Edinburgh in the year 1831. Reichenbach discovered paraffine when engaged in an investigation of the several products contained in what is commonly known as tar, resulting from the distillation of wood—more particularly from beech wood—and also from the distillation of coal. Christison discovered the same substance during his investigation of native petroleum, from Rangoon, from whence he derived its name.

Paraffine, as a commercial product, is but of recent date, and a description of its properties may not be uninteresting. It is a crystalline substance of a pure white colour, inodorous, and tasteless; to the touch it is almost similar to spermaceti. It is not volatile at ordinary temperatures. On the application of heat it melts into a colourless and transparent fluid, and may be distilled, undergoing but little alteration. Its density is 0·870 water being taken at 1000. Chemically it is peculiarly distinguished by its remarkably feeble affinity, uniting but indifferently with acids, alkalies, gaseous, or other substances or elements; hence the derivation of its name—*parum affinis*.

The printed works set up as prior publications were as follows:—Poggendorf's *Annalen*, vol. 24, 1832, which states that in Schweigger's Journal, vol. 59, p. 436, vol. 61, p. 273, is contained a description of Reichenbach's discovery, and after describing his new substance, and alluding to some of its properties, goes on to state that paraffine, together with eupione, a substance that occurs with paraffine, appear to be contained in the tar of all animal and vegetable substances, as also in coal tar. The *Traité de Chimie* of Berzelius, translated into French by Esslinger, 1832, contains a description of the production of paraffine from beech wood, together with some of its properties; it concludes with an extract from Reichenbach's original paper, in these words:—"Reichenbach thinks that this substance will one day come into use, and that, for example, it may be employed in the manufacture of candle, and in greasing machinery."

The *Annales de Chimie et de Physique*, vol. 50, 1832, contains a translation, not of Reichenbach's original paper, but of a notice contained in Poggendorff's *Annalen*, vol. 24, 1832, to which we have referred.

In Schweigger-Seidel's *neu s Jahrbuch der Chemie und Physik*, vol. 8, 1833, is contained a reply from Reichenbach to Dumas, on a paper which appeared in the *Annales de Chimie et de Physique*, and which referred to a paper written by Reichenbach, in 1831, on the production of napthaline. After pointing out the errors which Dumas had committed, and proving that his deductions were incorrect, his reasoning false, and that he had failed to understand the special points contained in Reichenbach's paper, he goes on to show how napthaline may be obtained from coal, and how another substance, called paraffine, might be obtained by distillation at a lower temperature, without the formation of napthaline; and, finally, makes known for the first time that napthaline is a product which results from the distillation of coal at a high temperature, and that paraffine is produced at a temperature lower than that necessary for the production of napthaline. The paper containing this statement, has been the source of the many extracts referred to, and as it may be of interest to our readers, we give, *in extenso*, the quotation from this celebrated controversy:—"The vessels in which the carbonization is performed should on no account attain a red heat; but as this must be considered unavoidable in the case of coals, where the charge must be coked quite to the centre, we must take up, by fractions, the tar which is distilling over, change the receiver from time to time, and make use only of such tar as undoubtedly passed over before the retort began to become red hot. Towards the end, when a red heat commences, some napthaline always forms, and which, indeed, under the disguise of the so called para-napthaline, mixes itself with the whole tar, and causes it to contain napthaline indiscriminately, if we had not previously secured that portion of the tar which contains napthaline. I always went to work in this manner, by placing pit coal in a large glass retort in a sand bath, and then distilling it out of a cast-iron bath, which I never allow to become red hot. So long as I proceeded in this manner, I always obtained tar which was composed of eupione, creosote, picamare, paraffine, copnomar, pittacal, sulphur, &c., but contained no napthaline; but as soon as I exceeded these limits, I could trace the presence of napthaline in the tar, which is then recognised later by its cauliflower-like crystallizations in the neck of the retort."

Turner, in his *Elements of Chemistry*, 5th edition, 1834, page 398, states that paraffine is procured by distilling tar derived from the igneous decomposition of vegetable matter, and especially of beech wood. He also states at page 872, that tar is produced in large quantities by the distillation of wood, and in the preparation of coal gas; and that Dr. Reichenbach has made the tar obtained from such sources the subject of an elaborate investigation, and has discovered in it no fewer than six new substances, and amongst them is paraffine.

A statement is contained in vol. 1 of Erdmann and Schweigger-Seidel's *Journal*, 1834, that in the 2d part of the 18th vol. of the *German Year Book of Pharmacy*, "an advertisement appeared about the sale of paraffine and other substances contained in tar, to the effect that large quantities might be obtained from Herr Simon at Berlin." This announcement, however, proved to be premature, Herr Simon not having yet succeeded in producing paraffine in marketable quantities.

Dumas' *Chimie Appliquê aux Arts*, 1835, contains a translation of the original papers of Reichenbach, with some details as to the production and the properties of paraffine, and concludes with a regret that the process of extracting paraffine from vegetable tar is so long and so complicated, and with the suggestion, that could it be obtained in large quantities it might be employed in the manufacture of candles, and as a substitute for wax. M. Dumas also states that M. Laurent has obtained paraffine in the distillation of bituminous schists, and that by the employment of alcohol and ether in the purification of the crude substances, pure paraffine may be obtained.

Mitscherlich's *Chemistry*, translated by Stephen Hammick, 1838, page 201, contains a statement to the effect, that by distilling coals, as well as animal and vegetable substances, an oleaginous, besides an aqueous fluid, is formed, and then enumerates the several processes necessary to separate and purify the paraffine from the substances contained in the oleaginous fluid. At page 1086 of Kane's *Chemistry*, 1841, Sir Robert states that paraffine, which is an important constituent of the tar produced by the distillation of wood, is also found associated with coal, and at page 1097, he states that the products of the distillation of coal in close vessels, possess a remarkable analogy to those that have been now described, and, indeed, in many instances, are identical with them. Thus the gaseous products, are marsh gas, olefiant gas, and carbonic acid. The liquid products consist of various bodies closely analogous to petroleum, and the solids consist of napthaline and paraffine. The relative proportions of these products vary with the temperature. The lower the heat employed, the less gas, and the more solids and liquids are produced; the higher the temperature, the greater is the quantity of carburetted hydrogen; but for the purposes to which the practical process is applied, the temperature must not be raised too high, for then the gas evolved would be mostly marsh gas and pure hydrogen, which possess little illuminating power, whilst a great deal of illuminating power may be derived from the vapours of some highly volatile liquid products. In the manufacture of coal gas for the purpose of illumination, the object is, therefore, to maintain a temperature too high for the production of much napthaline or paraffine, but not high enough to produce hydrogen or marsh gas, and thus obtain the greatest possible quantity of a gaseous product of olefiant gas, and vapours of liquid carbo-hydrogens.

The *Encyclopædia of Chemistry*, by Booth and Morfit, published in Philadelphia, U.S., 1850, states in reference to the products of dry distillation, that these products are somewhat analogous to those derived from wood, and some are identical with them, but no mention is made of what substances are to be employed in order to obtain distillatory products resembling those from wood.

We will now proceed to give the several specifications of patents relied on by the defendants as prior publications. The first is that of the Earl of Dundonald, in 1781, for "a method of extracting or making tar, pitch, essential oils, volatile alkali, mineral acids, salts, and cinders, from pit coal," and consisted in admitting the external air to have a passage or passages through the vessels or buildings in which the coal from which any of the above substances were to be distilled was put, whether by itself or along with limestone, flints, iron ore, bricks, or any other substance, by which means the said coals after being kindled, were enabled, by their own heat and without the assistance of any other fire, to throw off in distillation or vapour the tar, oil, alkalies, acids, and salts they contain, into receivers or condensing vessels communicating with the vessels or buildings containing the coals, and at the same time of wasting, calcining, or burning any substances that may be mixed with them.

The next specification relied on, that of Mollerat, relates more particularly to the "manufacture of illuminating gas," and does not refer to any improvements in the production of paraffine, or of paraffine oil; and, in fact, this specification did not form any element in the arguments on either side.

Count de Hompesch obtained letters patent in 1842, for "improvements in obtaining oils and other products from bituminous matters, and in purifying and rectifying oils obtained from such matters," and he effects their distillation in the following manner:—Having well cleaned, reduced to powder, and sifted the schiste which is to be operated upon, I proceed to fill the retorts. Each retort, when filled, contains about one hundred pounds weight. I place the charge in the receiver, *m;* (see

Fig. 1.

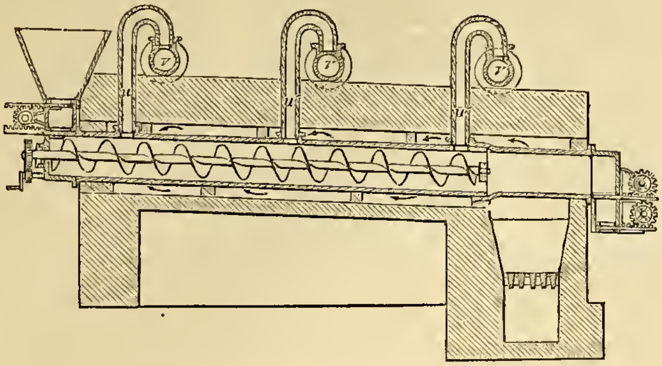
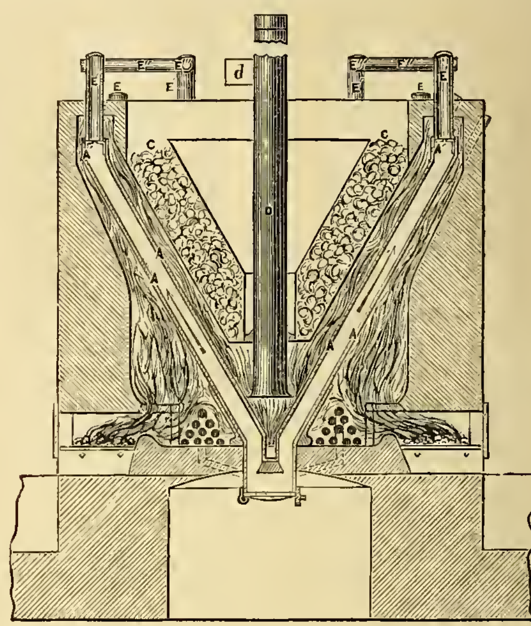


Fig. 1,) the workman opens the hoppers, and the charge falls into the box below, from whence it is received into the retort. The workman turning the screw, pushes the charge partially forward, and heat is then applied until the temperature reaches 100 degrees Reaumur, at which heat essential oil will rise in vapour through the tubes, *u*, into the tube, *v*, and from thence through another tube into a condenser or refrigerator, where the vapour is condensed, and an essential oil obtained. The charge having been now subjected to this temperature for half an hour, the workman, by the application of the screw, passes the charge further on in the retort, which is now subjected to a heat of 200 degrees of Reaumur, by which increased heat the vapour given off, passing as before, through a separate tube, *u*, into the tube, *v*, and from thence through a tube into a separate condenser or refrigerator, and as before, becomes condensed, and the intermediary or fat oil is thereby obtained. After having subjected the charge to this increased temperature for about half an hour, the workman again, by the operation of the screw, pushes the charge further on to the end of the retort, where it becomes of a red heat, and the vapour then given out, passing, as before, through its separate tube, into the tube, *v*, and from thence into its separate condenser, yields the thick oil.

Du Buisson's specification of 1845 relates to "new and improved methods for the distillation of bituminous schistus and other bituminous substances, as well as for the purification, rectification, and preparation necessary for the employment of the productions obtained by such distillation for various useful purposes." He states that bituminous schistus and other bituminous substances, such as clay slate (which latter is, however, more scarce), are to be met with, like coal, in large quantities in veins and masses in various parts of Europe; France and England contain very large quantities. The following gives the description of the furnace employed for the distillation of schistus or any other bituminous rock:—This furnace (shown at fig. 2) is composed of a conical or funnel-shaped retort or pyramid, formed of two funnel-shaped vessels, A, A, of different sizes, placed one inside the other, so as to leave a space between them to receive the schistus to be distilled. The space between the cones is hermetically closed by a ring, A', furnished with pipes, E, E^1, which serve as supply pipes for the schistus, and also for the escape of the vapours evolved during the process of distillation. For this purpose the tubes, E^1, E^1, are furnished at their sides with pipes, E^{11}, which serve to supply the pipes, E^{111}, which conduct the distilled vapours to the hydraulic main appointed to receive them, and also for the escape of steam which does not contain any oil, and to clean the tubes when necessary. The bottom of the interior cone is stopped up by a moveable metallic stopper, whereby it may be emptied of cinders which may accumulate during the operation. The two cones are kept at a suitable and uniform distance apart by means of metallic ribs. There is a third cone, C, which serves to conduct the flame and hot air from the fire-place to the chimney, D, which must be protected as much as possible from the heat. The flue or chimney, D, must be furnished with a small fire-place, *d*, for the purpose of assisting the draft when the fire is first ignited. When the flame from the fire-places rises up the side of the hollow cone, A, and passes through the space left between the cone, C, and the hollow cone, A, into the chimney, it communicates a great portion of its heat to the outside of the hollow cone in passing up along its outer surface, and inside on passing down to the chimney; the hollow space, A, thus deriving heat from both sides. The width of the flues for the passage of the flame must be regulated in proportion to the distance that the flame has to travel from the fire-places and the surface required to be heated; the fire-places must be constructed in such a manner as to allow the flame to divide and issue therefrom at both sides of the furnace, and the bricks at the end must be placed edgewise at certain distances apart, in order to allow heat to pass to the bottom of the cone. The cone, C, is filled with sand or carbonate of lime, or any other substance which is a bad conductor of heat, and which might be most easily removed in case any repairs should be necessary. I place either on the bed of the furnace or at any convenient height a series of steam pipes, I, joined together, so as to convey steam from a boiler or generator into the conical retort containing the schistus, which steam on passing through these tubes, which are heated to redness, acquires a high degree of temperature. The steam is made to enter the conical retort at its lower extremity (as

Fig. 2.

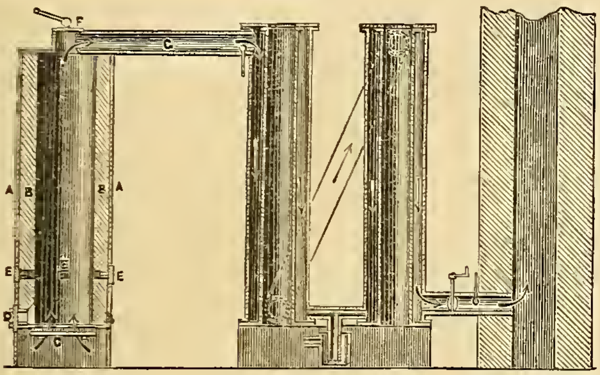


shown by the arrows). I adapt two, three, or four series of steam pipes; the entrance of the steam into these pipes (which are heated to redness) is regulated by means of a stop-cock in the main pipe leading from the steam generator.

The plaintiffs alleged that the defendant's infringement consisted substantially in the use of two patents of Brown and Bellford. Brown's patent in 1853 is for "an improved method of treating coal and bituminous substances, and for improvements in the treatment of their volatile products." The first part of his invention consists in an improved mode of distilling coal and bituminous substances so as wholly or in great part to prevent the decomposition of the volatile compounds. And the nature of his invention is as follows:—Having provided a retort similar to those used in gas-works, or of any other convenient form, this retort is fixed or set in a furnace in such a manner that a pipe or tube may be passed either within or without the retort from its mouth to its farther end, and fixed so that it terminates or opens into the furthest end of the retort, its other end being without or exterior to the furnace. By this arrangement the tube is heated red hot when the furnace is in action, and consequently if a current of steam be then propelled through the tube it must become heated to a red heat ere it leaves the tube to enter the retort.

Mr. Bellford's patent, also in 1853, is for "improvements in the manufacture of certain mineral oils and paraffine." His invention consists in an improved system of distilling cannel or parrot coal, argilo-bitumen, coal shales, or other similar bituminous matter, so as to extract oil containing paraffine therefrom, in larger quantities than is effected by the systems of distilling similar materials heretofore used by manufacturers of such products. In order to carry out his invention he constructs a furnace or kiln similar in some respects to an ironfounder's cupola, as shown at fig. 3, which furnace is formed of an outer casing, A, A, of stout sheet iron or other suitable material, lined with fire bricks or fire clay, B, B, its height being about five times its interior breadth, and its capacity such as to contain about three tons of the materials which it is desired to subject to distillation. The bottom of the furnace is open, but immediately below and separate from it is a fire grate formed of furnace bars, C, sufficiently distant from each other to allow the ashes to fall through freely; and if the bituminous matter operated upon does not, when the carbon is expelled from it, fall into a soft ashy residue, it is found that a small ash door, D, may be advantageously applied to the side of the furnace bars, through which the ashes or combustible residue can be withdrawn. The top of the furnace is provided with a moveable cover, F, capable of being hermetically sealed by luting or otherwise, and of sufficiently large dimensions to allow of the introduction through it into the furnace of the materials which it is required to subject to distillation. The exit for the volatile products of distillation and the gaseous products of combustion is by a pipe, G, fixed near the top of the furnace for conducting the said products to a refrigerator, where the volatile products are condensed; and the gases are subsequently conducted into a

Fig. 3.



chimney of sufficient elevation and capacity to create a draft through the furnace; or the same effect may be produced by the application of an exhausting apparatus set in motion by steam or other power. E, E, E, are apertures in the sides of the furnace, which are generally closed by plugs or stoppers capable of being removed for the admission of air into the furnace, should that which it at any time derives through the furnace bars be insufficient to maintain the furnace at the proper temperature.

The plaintiff's case was opened by Mr. A. R. Clark, after which the examination of the witnesses was commenced by the Lord Advocate. The first witness examined was Dr. Penny, Professor of Chemistry in the Andersonian University, Glasgow, the substance of his evidence is as follows:—"I am aware that paraffine was first discovered by Reichenbach, a German chemist, about the year 1830, in wood tar, especially beechwood tar, and he detected it, amongst other substances, in tar from coal. He described it as a colourless, crystalline solid, fusible by heat, volatile at a high temperature, and remarkable for its indifference to other substances. From that time it was known that paraffine could be obtained by a laboratory experiment from the tar of beechwood. Until the specification of Mr. Young's patent came out there was no method known of producing paraffine from the distillation of coal or any other substance as an article of commerce; although such a result was much desired by chemists. Dumas in his *Traité de Chimie*, and Liebeg in his *Familiar Letters on Chemistry*, particularly speak of the great advantages such a result would give. I have read Mr. Young's specification, and the object of the invention as there described is the economical production of paraffine and paraffine oil from coals, effected by gradually heating up the coals to a low red heat, keeping them exposed to that heat so long as volatile matters distil off. Mr. Young inaugurated a new manufacture. The several features of novelty in Mr. Young's invention are, 1st, the production of paraffine and paraffine oil from bituminous coals, and not from coals in general; 2nd, the gradual heating of the vessel in which the coal is distilled; 3rd, the obtaining paraffine and paraffine oil direct from coals without the production of tar; 4th, that cannel coal yields more of the desired products than any other coal. These products have become extensively used for the practical purposes of life, for burning, and for lubricating machinery, both in the solid and fluid state; its peculiar excellences are, that it does not evaporate by exposure to the air, (or very slowly), does not thicken or become viscid, and that the lighter oils burn with a flame without smell, in a properly constructed lamp. I have read the several extracts from published works (above set out); there is no explanation or indication of the process and result for which Mr. Young got his patent in any of them. The reference to paraffine in Sir Robert Kane's work is exceedingly vague and would be of no use to a practical man. Paraffine and naphthaline are not produced at the same temperatures. Mr. Young's process is not indicated in Mitscherlich's *Practical and Experimental Chemistry*, the statement there merely goes to the extent that paraffine may be distilled from coals, but gives no process. There is nothing in Booth and Morfit's *Encyclopædia of Chemistry*, published in America in 1850, to indicate the production of paraffine by Mr. Young's process. The authors have fallen into the same error as Sir Robert Kane as to the production of paraffine and napthaline. Dumas' work in 1835 goes to state that the products produced by Mr. Young may be obtained in the largest quantities from the tar of wood, and therefore no manufacturer would be led by it to resort to coal when told there is a better and more abundant material. The author expresses strong regret that these products cannot be obtained in quantity. I obtained paraffine and paraffine oil as a matter of experiment in 1849 from Boghead coal, but I did not know the paraffine when I got it, had I known of Mr. Young's specification at the time I should have known what the products were. Brande's *Dictionary of Science*, and Brande's *Manual of Chemistry*, give a fair description of the properties of paraffine as a product of beechwood tar. There is no mention of coal. Turner's *Elements of Chemistry* does not refer to coal. The *Annales de Chimie et de Physique*, gives merely a repetition of Dumas' statement. There is a communication from Reichenbach himself to the *Journal*, which demonstrates that naphthaline was not produced at a low temperature; he gives no process for the extraction or separation of paraffine; there is nothing there in anticipation of Mr. Young's discovery. Poggendorff's work is almost a repetition of Dumas' article in 1835. Berzelius' *Traité de Chimie* refers to beechwood as the source from which paraffine is derived. He does not mention it as obtainable from coal Graham in his work of 1842 refers to paraffine as a product of wood tar. None of the extracts produce any change in my opinion. I have read the specification of Lord Dundonald's patent; it disclaims the use of closed vessels for distilling coal. Paraffine and paraffine oil were not then known. The object of the invention was the obtaining tar, pitch, &c. There are no directions given as to the temperature to be used. Mollerat's specification is of an invention for the manufacture of gas. There is no indication of a manufacture of paraffine by distillation of coal; the specification is limited exclusively to shale and schistus. Du Buisson's specification relates to the distillation of schistus for the purpose of obtaining oil, and has no reference to coal. He draws a distinction, excluding coal. He did not include coal in his description of substances to which his patent was to be applied, and clearly did not comprehend coal. Du Buisson's description of bituminous schists is not applicable to bituminous coal, which do not contain any animal remains. Hompesch's invention related only to schists; the disclaimer does not change my opinion. I have seen the specifications of Bellford's and Brown's patents. Brown's specification is similar in principle and practice to Young's. Bellford's is the same. It is a distillation of coal at a low red heat, and of the material parts of Young's invention. I have analysed other coals to ascertain if Mr. Young's invention would be applicable to them with advantage, and I think it would to Wemys, Brown, DeMethel, Capeldral, Overtou, Rochsoles, and Auchinbeath. The specific gravity of the crude oils from all of them is lighter than water. Ordinary gas tar sinks in water. Nearly all these coals were in the market and used for gas purposes before Mr. Young's patent. Cannel coal is dull in aspect, containing a large quantity of volatile matter when distilled. It burns with a bright flame in the open fire, separating more or less into lamina, with less heat than some other coal.

Cross examined by Mr. Young:—When the Torbanehill coal was first discovered, it was sent to me for analysis. It exceeds anything known as a gas coal. The Rochsoles coal has as much clay in it as the Torbanehill. The Boghead has an unusually small portion of fixed carbon. All thatI actually know on the question, whether it is a true coal or not, is, that a trial took place in 1853, at which time there were many scientific witnesses on each side, and there was a discrepancy in their opinion as to the nature of this coal. I was analysing this coal for Mr. Russell when I ascertained it was both an excellent gas producing coal, and an excellent oil producing one. The oil I produced was similar to that at Mr. Young's works, and also similar to that produced at respondent's works. I obtained the liquid products in a notable quantity The result surprised me. I subjected the coals to distillation at a bright red heat. All distillation must be at some temperature. I obtained the notable quantity of oil at a lower temperature than that used for gas. Coals have been distilled for many years for gas purposes. I am aware of no other mode of obtaining gas than that by distillation. Liquid products from the tar of coal are also produced by distillation. When coal is distilled at a high temperature it produces gas and certain other liquids. When distilled at a low temperature it produces liquids of different qualities. High temperature produces tar, which sinks in water; low temperature produces light oils. It was unknown to me and to others in 1849, that when coal was distilled at a low temperature, instead of giving tar which sinks in water, it gave oils which float in water. It was not known prior to 1849 that the liquid obtained by distilling coals at a low temperature floats in water. The world in 1849 was not acquainted with the fact, that when coal was distilled at a low temperature it yielded an enormous quantity of paraffine oil. It was known it would yield a large quantity of something, but not what Young's specification gives the information that this particular product may be obtained in remarkable quantities at a low red heat. The process of distillation at a high temperature was well known, as applied to coals for the production of gas. Mr. Young first pointed out a new manufacture. Petroleum is similar to the oil obtained by Mr.

Young, in containing paraffine. It is not a correct representation of it to call Mr. Young's oil a petroleum artificially produced. Sir Robert Kanes' work does not give the public the information that the products of the distillation of coal at a low temperature were light oils but were tar. There is an essential difference between petroleum and paraffine oil. Petroleum consists chiefly of naptha. In Young's product there is no naptha, and in the paragraph read, there is no description of any method of producing paraffine oil or paraffine. The invention was not available for practical purposes without further research. A practical man must be informed at what temperature a process of distillation should be carried on.

Mitscherlich's products were the same as Young's. Young's improvements are specified as a distillation of coals in a retort gradually heated up to a low red heat. If paraffine could be produced by other means, it would not come within Young's patent. I have detected paraffine aud paraffine oil in the products of coal distilled at a high temperature, but not in quantities. A low red heat is understood by practical men as the heat at which iron becomes a dull red. In distilling house coals at a low temperature, tar is obtained, and a small quantity of a lighter oil. The cause of the difference in the temperatures when I got oil in place of gas, in experimenting on the Boghead coal, was that the retort was not sufficiently heated.

Lord Dundonald's patent is for the distillation of coals in an open vessel. There is essential difference between distilling in close or open vessels. Paraffine oils could not be obtained commercially by that process. Reichenbach refers to different qualities of tar produced at a low and a high heat. Mollerat's patent may refer to oil obtained at a high heat. I cannot say that the schistus oil of Mollerat ordinarily gives paraffine. I find that some bituminous schistus do not contain paraffine oil. The bituminous schistus contains the same component parts as the Torbanehill coal; but, when subjected to distillation, they yield different products. When I take shale and coal, I actually find the fact that the products are dissimilar. I am not aware that bituminous shale is used for the production of gas. The modes of distilling shales and coals are the same. The same products require the same treatment. Du Buisson's patent is for improvements in distilling bituminous schistus and other bituminous substances. He does not refer to all bituminous substances. Du Buisson's temperature of distillation is similar to Mr. Young's, but he does not comprise coal. Hompesch's patent and the disclaimer do not refer to coal. The products are different in the cases of Hompesch's and Young's processes. I think the oils obtained by Hompesch would depend on the nature of the schistus distilled. The paraffine oil from the coals I named was not all of the same quality. They were all inferior to the Boghead. Two or three yielded oils of very nearly the same quality. I refined the crude oils, and ascertained the portion of purified oil. I obtained both the lubricating oil, the burning oil, and the paraffine. I am not prepared to give the per-centage of paraffine in the Boghead oil, but it was, certainly, more than ten per cent. I am not prepared to determine the quantity of paraffine oil in the other coals. I never separated the paraffine from the oils. I determined the quality of the crude oil by the quantity of purified oil it contained, by the specific gravity of the purified oil, and the effect of cold. I selected the cannels named because they contained the largest quantity of the volatile matters. I experimented on coals I knew would be bad as well as good coals. Next to Boghead coal the Methel coal is most bituminous, Capeldral is next to Methel, and Overton succeeds. Of the coals known at the date of the patent, some might have been advantageously used for the purpose of obtaining the products Mr. Young obtains. In practice Boghead only has been used. Boghead came into use as a coal about 1850. I do not think the discovery of the Boghead created this manufacture. The New Brunswick coal would give a larger yield of this substance. The analysis of the oil from Kimmeridge shale is essentially differeut to that of the Boghead coal.

Re-examined by the Lord Advocate:—I made an analysis of the Kimmeridge. I subjected the shale to Mr. Young's process, and obtained less than 1 per cent. of paraffine from it. The oil was substantially different to that obtained from the Boghead mineral. Mr. Young's works are situate close to the Boghead coal. It would be absurd to use any other coal there. If Boghead had not been discovered, and the experiments had been made with Methel, the results would have been the same. The distilling of coal at a low red heat was never investigated prior to the date of Young's patent to my knowledge. There was no known object to be got in distilling the canuel coal at a low heat until Mr. Young's patent. The fact that the low red heat would produce oil and not gas was only known to be avoided at the date of Sir R. Kanes' book. I should not have distilled coals at a low red heat to obtain napthaline. The gradations of heat are low red, cherry red, bright red, and white. I do not gather from any of the works any process for distilling coals at a low red heat. Lord Dundonald mentions no degree of heat Putting Torbanehill into Lord Dundonald's furnace would not be a practicable method of making paraffine. Du Buisson's mode of distilling is not Young's. In Hompesch's specification the heat used—100 degs. Reaumur—is uot a low red heat; 200 degs. is not. I find uo indication of the same temperature in any of the degrees of heat mentioned. The main difference between schist aud coal is, that the one is useful for fuel and the other not. The general structure is different, and the chemical results of its destructive distillation are very different. I think Stand coal would yield paraffine profitably, and also Lesmahagow, Kelvinside, Auchldean, Riggside, and Lanemark. I should not try any coals containing less than 44 per cent. of volatile matter.

Again cross-examined by Mr. Young:—Du Buisson heats the steam, and might heat it to a red heat, not to a low red heat. The temperature of the steam is the important feature. Hompesch suggests a comparatively low temperature. Boghead might be useful for fuel if no other could be obtained.

Dr. Odling, F.R.S.—"The novelty of Mr. Young's invention consists in pointing out for the first time a method of making directly from bituminous coal, by distilling at a low red heat, paraffine and paraffine oil. Reichenbach obtained paraffine from tar and not by a direct distillation as in Young's invention. Paraffine was regarded as a difficult substance to get before the date of Mr. Young's patent. Lord Dundonald's patent does not disclose paraffine or paraffine oil as substances to be obtained. His leading products were tar and pitch, the tar was used for protecting ships' bottoms. There is nothing in Mollerat's specification to shew he was aware of the existence of paraffine. Hempesch's specification makes no mention of paraffine as one of the products of his process. Hompesch's disclaimer limits the invention by using the word bituminous. Hompesch's specification does not disclose Young's invention. Du Buisson's specification refers to paraffine and paraffine oil. He points out schistus as the substance producing paraffine, and that other bituminous matters do not contain paraffine in such large proportions. I infer that he does not iuclude coal as a substance to be worked upon from his own words. I do not call to mind any one of the parts referring to a low red heat. The information given by Sir Robert Kane is incorrect. It is quite impossible to have paraffine and naphthaline at the same heat. The passage does not disclose a manufacture of paraffine. Napthaline is a useless product at present. If paraffine and naphthaline could be had together it would be a useless product.

Mitscherlich speaks of the distillation of coal. There is nothing there said as to degree of heat to be used to produce products after described. He speaks of pressing the crystals between blotting paper, clearly pointing the thing out as a mere laboratory experiment. Paraffine was a chemical curiosity at the date of that book The state of the knowledge, as disclosed by Dumas, points out paraffine as existing in coal tar. It could only be in small quantities, as the production of the tar would involve a higher temperature than that best for producing paraffine and paraffine oil. Dumas points out that paraffine might be used for candles, but such application was never carried out till 1850. I do not find anything in the books in anticipation of Mr. Young's invention. Reichenbach, in speaking of making paraffine from coal, describes a process by which a tar could be optained from napthaline, but contains eupione, creosote, picamare, paraffine, copnamar, pittacal, and sulphur, &c. Brown's patent is the first patent after Mr. Young's, which refers to coal as a substance yielding paraffine by distillation. It is the same as Young's patent. Bellford's patent is for distilling in open furnaces, at a dull red heat. He lights his coals in the inside of the retort, and Mr Young heats his retort on the outside. Brown's aud Bellford's patents use all the points claimed by Mr. Young.

Cross-examined:—Mr. Young obtains directly by the first distillation an oil containing paraffine in which you can see the paraffine. I know what Reichenbach obtained it from. I don't know how he obtained it. Young's product of distillation is not tar, and has not the properties of tar. Du Buisson says that a red heat causes the production of a quantity of gas, and the object is to keep the red heat as short a time as possible. Brown's patent is something in addition to Young's patent, but includes all Mr. Young's points. He specifies the temperature distinctly. You can raise steam to any height you like, so as to distil with steam at a bright red heat After the burning oil and the paraffine have been extracted from the products of the distillation of coal at a low temperature, there remains an oil used for lubricating purposes. I do not know that there is a residuum of tar. I think there is none. I have not seen any. I have seen the oil running over without tar. I mean to say that paraffine oil and paraffine would not be obtained as commercial products by Lord Dundonald's process. If you work at a high temperature, coke would be obtained; tar also, and gas, but not much oil. You can either admit or increase the temperature by the admission of air. The largest quantity of the liquid products are obtained at the lowest temperature, and Mr. Young's oil is not a volatile or essential oil. Sir R. Kane mentions the getting the paraffine and napthaline mixed. I know no method by which, if paraffine and napthaline were mixed, they could be separated, except as a laboratory experiment. The action of sulphuric acid on napthaline would form a new acid called sulpho-napthalic acid. In the schists I have seen, I saw fossil remains. There is no specific test for animal matter that I am aware of. No animal matter has ever been detected in Torbanehill coal

Mr. James Young, the patentee, examined by the Lord Advocate—I took to chemistry in early life, and attended Professor Graham's lectures over thirty years ago. I then became his assistant in his class and in his laboratory. I was with him seven years. I afterwards went to be the manager of Mr. Muspratt's Chemical Works, Newton, near Liverpool. I made the acquaintance of Dr. Playfair very early in Professor Graham's laboratory. From Muspratt's I went to Tennant's of Manchester, a branch of Tennant's in Glasgow. When at Tennant's, Dr. Playfair informed me of a petroleum spring on his brother-in-law's estate at Alpeton, and I finally took a lease of the spring. The petroleum gradually reduced in quantity, and I then imagined that a similar substance to the petroleum might be obtained by artificial means. I had an idea the petroleum might be produced from the coals. I made a great many experiments, extending over two years. I had not then heard of the Bogbead coal. I had no assistance in the experiments. I began with a furnace coal, and afterwards tried Wigan cannel coal. I obtained a liquid. I did not know what it was then; it contained paraffine. Latterly I began to find the best temperatures, but it was a long time before it was seen. D'Persit heard of Boghead coal in the beginning of 1850. I afterwards tried several other Scotch canuels both before and after the patent, and before the works at Bathgate were decided on. The results varied very much. Some of the Fifeshire were very good. We finally resolved in erecting works at Bathgate, from the then price of the coal. Before works were erected, I took out the patent. I had not then seen any of the foreign chemical extracts. I had seen Graham's and Brande's works. I had access to the books of English authors. I was not aware of Reichenbach's letter to Dumas. I became aware of it first in 1854. I saw no books to lead me to the conclusion that low red heat was the best. I came to that conclusion from my own thoughts entirely. I never heard of the patents before mentioned before I took out my patent. I had heard of Lord Dundonald's works from Professor Graham in a lecture. (Mr. Young then described his process as specified, and produced samples of his products.) I consider the novelty of my invention consists in the economical production of paraffine and paraffine oil from bituminous coals, by the application of a low red heat.

Cross-examined by Mr. Young:—The Derbyshire mine, from which the petroleum was obtained, was a common house coal mine. I obtained from petroleum an oil for burning, much in the same way as I now obtain the oil for burning from crude paraffine oil. I obtained paraffine, but not in quantities to sell. If there was solid paraffine in the burning oil, it was not intended. There was a great deal of paraffine in the petroleum. I extracted paraffine from the pit in 1848 in small quantities. It occurred to me that I might obtain a substance like petroleum from coal, by distilling it. There are various ways of distilling coal. You can distil coals at any temperature, under pressure or without pressure, alone or mixed with various substances. I then knew about coals what was generally known amongst chemical managers, I knew that cannel coals yielded most gas. I did not know they yielded most liquid. I did not know they contained most hydrogen. I knew anthracite was not a gas coal. It was stated in books to be nothing but pure carbon. I knew anthracite was the very opposite of bituminous coal. I never distilled anthracite, but did distil house coal. Some of them are bituminous coals I obtained an oil analogous to petroleum. I made this discovery in in 1850 or the year before. I knew Sir R. Kane's *Elements of Chemistry*. His description gives us no idea of what the solids and liquids referred to are. We began to build in 1850, and we manufactured in 1851. We began with Boghead. Several times we have used other coals—Methyl and Lesmahagow. My partner has a lease of Methyl. I have nothing to do with it. Boghead is not best now, it was when I began. It was then 13s. per ton. In my specification I gave the best directions I could at the date of the patent.

Dr. Lyon Playfair, C.B., F.R.S.—I have known Mr. Young many years, and consider him an excellent practical chemist. I consider Mr. Young's patent is the first account which would enable a manager or workman to distil paraffine or paraffine oil from bituminous coals in commercial quantities. What I learned from Mr. Young's specification was new to me. I am aware that Liebig, Dumas, and others, wished to obtain paraffine, and Mr. Young's practical result is what Liebig, probably the most distinguished chemist in the world, had desired to obtain. None of the extracts referred to would enable a manufacturer to manufacture paraffine. I had never seen paraffine from coal before the date of Mr. Young's patent. I never had a specimen of it a quarter of an ounce in weight. Mr. Young's crude oil is not a tar. (Dr. Playfair was afterwards examined as to the several patents, but as his evidence was similar to that of the prior witnesses, we do not give it *in extenso*. Nothing of interest was elicited in his cross-examination).

Sir Robert Kane, F.R.S.—At the date of my book (1841), the only use on a great scale of the distillation of coal was for the manufacture of illuminating gas. I had never carried on any experimental researches in the distillation of coals myself. I embodied what I considered the general information of the day in the passage referred to. Subsequent researches have proved that Reichenbach was correct, and that Dumas and Laurent, by whose authority I was guided in writing my book, were inaccurate. I followed the highest authorities of the time, who were afterwards proved to be wrong. I do not consider my work as in any way containing directions which would enable paraffine to be obtained as a commercial product in quantity. I believe that the fact of obtaining paraffine from the distillation of coal at a low red heat for commercial purposes is perfectly original with Mr. Young.

Dr. Hoffmann, F.R.S., LL.D.—The novelty of Mr. Young's invention in 1850, consisted in submitting coal of a particular description to distillation, at a temperature of a particular degree, with the object of producing paraffine and paraffine oil. I do not think any one of the extracts discloses Mr. Young's invention. The specifications of the patents set out do not anticipate Mr. Young's invention. The processes described in Brown's and Bellford's specifications are substantially the same as Mr. Young's.

Dr. Letheby was afterwards called, and his evidence entirely concurred with that of the witnesses already given.

Mr. James B. Neilson, late engineer to the Glasgow Gas Company, and the celebrated inventor of the hot blast, was next called, and stated that during the thirty years of his connection with the Glasgow Gas Works, cannel, bituminous, parrott, or gas coals were used there, particularly Capeldrae, Knightswood, and Auchinheath or Lesmahagow. The heat used in gas making was between the colour of a soldier's coat and a bright red. The liquid products obtained were tar, ammoniacal liquor, and naptha. Coke made for the manufacture of iron is required to be made at a higher temperature than that employed in the manufacture of gas.

Witnesses were afterwards called to prove that the products of Lord Dundonald's works were coke for iron works, and coal tar, lamp black, brown tar, oil, and naptha.

Mr. Meldrum—Mr. Young's partner and the manager of the works —entirely corroborated Mr. Young in his evidence as to the petroleum spring in Derbyshire, and the experiments upon coal, both in England and Scotland, which finally led to the patent being taken out. He was also cross-examined at considerable length as to the manufacture generally, but nothing of importance was elicited in his cross-examination.

Mr. Bartholomew of the City and Suburban Gas Company, Glasgow, Mr. James Napier, consulting chemist, Glasgow, and Dr. Murray Thomson, Edinburgh, were also examined, principally to prove that the products obtained by Mr. Young can be obtained by the distillation, at a low red beat, of many other coals besides the Boghead and Torbanehill coals.

Other witnesses were called to prove the infringement by the defendants, the commercial importance of Mr. Young's invention, and also the complete failure of the works established at Wareham and Weymouth for the distillation of the Dorsetshire shale. With these witnesses the case for the plaintiff was closed.

Mr. D. Mackenzie opened the case on behalf of the defendants, after which the following witnesses were called:—

The first witness for the defence was

Mr. Dugald Campbell, who said—"I have had much experience in the distillation of coal. It became known to chemists generally that paraffine was a product of coal about 16 years ago. In 1847 I was shown lubricating oil, paraffine oil, and paraffine, by Mr. J. T. Cooper; he informed me they were the products of the Kimmeridge shale. Mr. Cooper was a very well-known consulting chemist in London, and he died four years ago. I did not myself obtain it from coal until after 1850. I obtained it by employment of Du Buisson's patent from bituminous shale. About 1847 Mr. Cooper showed me Du Buisson's patent and the products obtained from it, and I then experimented upon it. Cooper and I were very much together about that time. Camphine lamps and paraffine lamps are just the same. There was some difficulty in purifying these oils, and Cooper asked me to assist him in the mode of purification. I gave him some suggestions about that. I distilled some shale myself. I ascertained that Mr. Cooper had not used steam as described by Du Buisson. I distilled some both with steam and without steam. I got the very same products as shown me by Cooper, but of a superior quality. They were less odorous, and were more easily purified. I got an oil containing paraffine in a notable quantity. I purified that oil and analysed the products. I know the oil produced by both parties to this action. The oil sent me from Braithwaite's Shale Works was as near as possible the same as the crude oil produced by both plaintiffs and defenders. The Kimmeridge shale one had rather more smell. It was an oil containing paraffine and paraffine oil. I purified it. I separated the oils and the paraffine itself as well. I took the crude oil; obtained the light burning oil; the second oil, which will do for burning; thirdly, a lubricating oil; and fourthly, paraffine itself. I am familiar with Du Buisson's specification. The products I obtained from the oil are the same as those in Du Buisson's specification, and the oil itself was the same, and corresponded with the products set forth in Young's specification, only Du Buisson has one oil more, the medium burning oil. [The witness then stated the results of the experiments, with a view of showing that the products of the coals and shale were similar to the products obtained by Mr. Young.] We obtained paraffine from all but Kimmeridge; we used a less quantity of Kimmeridge. We saw crystals, but did not extract them. I am acquainted with Young's specification. I have read it and considered it attentively It begins by mentioning bituminous coals; with the exception of anthracite, all coals are bituminous more or less. The distinction between a bituminous coal and a bituminous shale appears to me that the residue remaining in the retort in shales is valueless, in ordinary bituminous coal it is not valueless. I am aware of no test for detecting the difference between bituminous coals and bituminous shales, they merge into one another. The mode of treatment for obtaining liquids does not depend on whether the article is on one side or the other. When I distilled Kimmeridge shale in 1847, I followed as closely as I could Du Buisson's process and got the products he mentioned. It was a low temperature. I tried the temperature of the steam as it issued from the pipe, and I never got it above 600° Fahrenheit. The pipes passed through a furnace heated with coke; applying low temperature gradually in distilling liquid products was not new to me; the reason for distilling low, is, that more liquids are obtained and less gas. This was well known before gas making was known. The information, that by distilling coal the liquid produced will be crude paraffine oil, was not first given to the public by Mr. Young. I was aware of all the researches by Reichenbach. It was Reichenbach who discovered it. The obtaining it at a low temperature was also known. I am acquainted with Mitscherlich's book, and the other books referred to, and the information is there conveyed, that by using low temperature upon coal tar or coals generally, in some of them you get an oil containing paraffine. Reichenbach calls what Mr. Young calls paraffine oil, eupione. I have distilled Boghead coal at a high temperature, and always obtained paraffine and paraffine oil, but in much less quantity than when I used a low temperature. The apparatus used by Lord Dundonald is a kiln very similar to that used by the Clydesdale Company at their works. It would be impossible to apply the heat by that specification, otherwise than gradually. Following Lord Dundonald's specification reasonably, heat would be applied at the bottom, and the kiln filled up with cold coals, the heat rises gradually up, and the coals are gradually heated as they come down. I have distilled three tons of the Muirkirk coal by Lord Dundonald's process of self-distillation. The coal is a furnace or house coal. I performed the experiment at the Clydesdale Company's Works. I got some of the products mentioned in Lord Dundonald's patent. I did not get the ammoniacal salt. I obtained the coke and liquid products, but did not separate the acids. The first product resembled liquid tar. I subjected that tar to distillation in a retort. I obtained an oil containing paraffine. I rectified the oil into two oils and separated paraffine from it. I also obtained a lubricating oil, and I separated paraffine from that. After I extracted the burning oil and paraffine, pitch remained. It was very good pitch. I purified the oil obtained by sulphuric acid. A very good coke was produced, suitable for smelting iron. My experience in paraffine goes back to about 1846. I was assistant to Professor Graham sixteen or seventeen years ago. At his lectures he exhibited paraffine, his specimen was an inch in length and half an inch in breadth or thickness. I always understood it had been procured from coal. I myself procured it from rosin about twelve years ago. I never saw paraffine produced from coals in large quantities (prior to 1851). It had never been so obtained to my knowledge. It was new to me, and so far as I know. So far as my knowledge went it might have been impossible to produce paraffine in merchantable quantities from coal. I began to investigate the subject in 1847, and was reminded of it in 1849, and from Reichenbach I learnt that if coals were distilled at a low temperature you obtained paraffine, if at a higher temperature you obtained naphthaline. It was general knowledge at that time that the lower the temperature the liquids are always greater, and Sir Robert Kane says the same thing. It is a notorious and elementary principle, and of general and universal application. It was from that general knowledge I said Mr. Young gave no information in directing distillation at a low red heat; that proposition is not true of naphthaline. I first saw Reichenbach's treatise in 1847 or 1849 In distillation of bituminous coal I should say water comes first, then water mixed with oil, then oil, then oil mixed with paraffine. The water would come off a little over 300° Fahrenheit; then all the eupione at that temperature. The heavier oil distils off between 700° and 800°. At 400° to 500° you would get less paraffine than at the higher temperature. It is not true of paraffine that you get it in greatest quantities the lower the temperature, if you use a temperature under a certain heat. I know Du Buisson's patent. I never applied steam into the retorts before. I believe the patent to be for the apparatus. His definition of bituminous shale is generally correct. The specimens of Kimmeridge shale I have examined were not exactly similar to his description. I do not think the smell from the shale oil arises from decomposition of animal matter. I understood Kimmeridge shale was to be had at no cost. If you distil coals like Lord Dundonald they will flame at 1000°. You may go to 2000° without flaming in a closed retort. Cannel will not flame more easily than household coal. The Muirkirk coal would flame at about 1000° according to Dundonald's process, that is, a little above a low red heat. Torbanehill would, I think, flame at a lower temperature. If Lord Dundonald's object had been to manufacture tar for ships' bottoms, his temperature would have been about 1000°. I get the best coke at a low temperature for smelting iron. Never knew coke for smelting iron made at so low a temperature as 1000°. In my experiments on the Muirkirk coal by Lord Dundonald's process I raked out the charges every four hours. There is nothing of that kind in Lord Dundonald's specification. If the charge were left for three or four days you would get tar and a very bad coke. Du Buisson's patent can be worked with or without steam. I have got a drying tar by Young's process. I consider Hompesch's patent novel, in his using the screw retort to heat the materials at different temperatures. It is a gradual heating up to a low heat If using Hompesch's process I should propose to get the most paraffine between the second and third heats. Paraffine oil is eupione. It has a little taste and a little smell. I could make it without taste or smell. With the exception of the napthaline part of Kane's statement it is absolutely true. There is a great difficulty in measuring temperatures. Workmen never measure temperatures; they use their own discretion with the eye. It might be done with pyrometers, and watching the products may assist. In experimenting on Reichenbach's process I got paraffine, and creosote, but not picamar.

Dr. Alfred S. Taylor, F.R.S., and Professor Brande, F.R.S., were afterwards examined, and their opinions coincided with Mr. Campbell generally. Mr. William Heathfield, formerly consulting chemist to the Shale Works at Wareham, was also examined as to his experience in distilling shales at those works. Mr. Evans, of the Chartered Gas Company, Horseferry Road, spoke to the use of the Boghead coal in gas making, and the products of the tar. Mr. Thomas Carlisle, the manager of the defendant's works spoke to their manufacture being according to Lord Dundonald's patent, and generally as to the defendant's manufacture.

This concluded the case for the defendants.

The Lord President made the following charge to the jury:—Gentlemen, in the first place, I think that this is a patent for improvements in the treatment of bituminous coals with a view to obtaining therefrom paraffine oil and paraffine. I think that a patent may be taken for a new method, or an improved method, of obtaining a product formerly produced, if the new or improved method has the effect of producing the old article more economically or in greater quantity. The subject-matter of the patent—the novelty of treatment—is that specified for producing the crude oil, from which crude oil the paraffine is separated by processes of purification, which are not now claimed, and which, upon a fair and not critical view of the whole patent I cannot say are claimed as new. The specification points out that bituminous coals, but more especially certain kinds of them, if treated in a certain manner, will give the paraffine oil containing the paraffine, of which you are in search. [His Lordship then read the parts of the specification which we have given above.] The novelty in this treatment of bituminous coals with a view to producing paraffine is said to be the applying of the heat up to a low red heat, and keeping it at that heat till the volatile products come off. It is not the mere process of the distillation of coal that is sought to be here patented as new, nor is it the apparatus by which this is done. Now, if this, which is said to be a novelty, really was a novelty, then I think that this might be made the subject of a patent. Novelty consists in this, that not the the very identical thing was never done before, but that nothing was known or done before that would obviously suggest or point out to any practical man to do the same thing that Mr. Young does. The first and leading point is the novelty of this thing—was it, or was it not, a novelty? The pursuer says that it was a novelty—that it was a discovery of his; and the defenders say that it was not so. Now, it is said that paraffine was a thing known before Mr. Young's experiments; and nobody disputes that. That is not made a question on either side. It was a substance that was found to exist by Reichenbach. Distillation is not a discovery of Mr. Young's nor can there be any question that the distillation of coals is not a discovery of Mr. Young's. But the defenders say (and they have led evidence on the point), that all the elements of novelty that are alleged to exist in this process of Mr Young's were previously discovered, and that this treatment of bituminous substances by Mr. Young, was a thing practised and known before. It it also said that distillation at a low temperature was a thing known. I don't know that you will have much difficulty in deciding as to whether that general law was promulgated before Mr. Young's time, and I don't know that there is anything, almost, in chemical science, or in any other science which may not be resolved into, or placed under the government of some general law. But the knowledge of the general law is not enough to exclude a certain novel application of that law. That the distillation of coals or other substances at a low temperature would give more liquid and less gas might be known, and yet how to extract paraffine out of coal, might be wholly unknown. These two things are perfectly consistent. Mr. Young says coals had long been distilled; they had been distilled at various temperatures, according to the object in view,—that is, for making gas, or for making coal-tar or pitch, but there was no rule for, or no mode of making, and no knowledge of how to make paraffine out of them, in any merchantable quantity; paraffine was a substance known; chemists looked upon it with interest; the mode of obtaining it in merchantable quantity was the desideratum; I looked about, and I found out the mode of obtaining it; I found that it could be obtained from the same substance from which you had been obtaining other things, but I found out that it could not be obtained in merchantable quantity, if you treated that substance in the one way, but that it would be obtained in merchantable quantity, if you treated that substance in another way—in a way that you had not been used to treat it. Now, whether that was a discovery of Mr. Young's, or whether it was promulgated to the world by Reichenbach, or in those journals which were published in this country, or whether, though not given in detail as Mr. Young gives it, it was given so plainly and palpably that he who runs might read, and showed not only that the thing could be obtained, but how you could obtain it—that is a question for you to determine. Now, upon this point the pursuer says it is very strange if it was pointed out and known, and if people were in search of this substance, that they never obtained it! And it is strange that such men as Dr. Penny and Dr. Playfair, and Sir Robert Kane, and those other men to whom reference has been made, were astonished at this thing that Mr. Young brought under their eyes. On the other hand, the defenders say, here are gentlemen of great scientific eminence—Dr. Taylor, Mr. Brande, and Mr. Campbell, who tell you that they found in these publications all that is contained in Mr. Young's patent. Now, gentlemen, you must place yourselves in the position of reading these publications as before Mr. Young had thrown any light on this matter. It was a remark made to us by the counsel for the defenders, that it will not do to go to one source and get one piece of information, and to another source to get another piece of information, and to bring these together, so as to produce a whole that will correspond. That was an observation which must be taken with great qualification. If the whole matters that are set forth were known, and there was no novelty except in applying one or two things—the putting the coal, for instance, into a known kind of retort—a gas retort—and applying to it heat produced by another known process, there might be something in the observation, and I need not go on to inquire into the solidity of it. But it will not do in all cases to extract each particular that composes the whole discovery, and say that nothing is new but the result. There may be such new arrangements of old processes, and such new applications of them as may be the subject of most useful and important discovery. The question for you is, whether this which Mr. Young describes as the treatment of the coal, by distilling it at a certain temperature and no higher as applied to coal, and the informing you that that was what you were to do, for the production of paraffine from it was altogether new But if there were other substances nearly akin to this treated in that way, and so as to produce that result, that raises another question. The defenders say, that there was another substance analogous to coal used in this way, and which so treated produced this result, and gave paraffine oil and paraffine, in full quantity. It is stated in regard to the works in Dorsetshire, in the first place, that they were works which were intended to operate upon a different substance altogether, viz., shale; and you have heard the opinions as to the difference between shale and coal, and will consider whether shale is substantially the same as coal. But, further, it is said that these operations were conducted in Dorsetshire, not at the low temperature, but at the high. The gentleman who went down to take charge of the works, Mr. Homersham, said so. That is what Mr. Young says is not his process. It is also stated that the results were unsuccessful—that it only resulted in a product which nobody would buy, and that the other has resulted in a product which everybody seeks to buy. You will judge whether that was substantially the same thing which Mr Young does, or was not substantially the same thing. As to the various publications. Mr. Brande, the eminent chemist and the author of several chemical works, who published as late as 1848, does not even mention coal as a substance from which paraffine could be extracted in any quantity. He mentions beechwood tar. Sir Robert Kane states that from coals paraffine may be obtained, but he does not tell you how to obtain it; he himself says that it did not occur to him that he had anticipated this discovery of Mr. Young's. It has been remarked in the course of the evidence, that Sir Robert Kane may have pointed it out though he was not aware that he had done so. Why, if he was not aware that he had done so, though he had written the book, you will judge whether it was so pointed out that it was generally known. Other people who had read his work were not aware that he had done so; people like Dr. Penny and Dr. Playfair, were not aware that he had done so. Du Buisson's patent is stated by the pursuer to be a patent that applies to shale and not to coal, and that it does not point to the temperature as being a low red heat. That is what Mr. Young says is the most important thing to attend to. Then as to Hompesch's patent the question is debated whether the application of heat is a gradual application. Mr. Young says you must gradually heat up to a low red heat, and keep it there, and take care never to let it get beyond that. Hompesch says that you must obtain first a heat of 257°, then a heat of 482°, and, lastly, a heat of a great deal more, according to what you wish to take off from the coal; then the coal is pushed forward to these heats by a screw; the question is, whether that mode of giving the heat by stages and halts is a gradual application in the sense of Mr. Young's patent, and whether it would produce the same results? A further distinction taken is, that this patent deals with shale, and not with coal; and I don't recollect that paraffine is mentioned in that patent at all. As to the patent of Lord Dundonald, I see that both of the parties have been treating it in rather a singular way. The pursuer has been contending that Lord Dundonald did not anticipate his discovery, and the defender has been saying that Lord Dundonald did point out a process which is substantially the same; but then the pursuer says, while I maintain that Lord Dundonald did not point it out, when you use Lord Dundonald's apparatus, you infringe my patent; and the defenders say, Lord Dundonald pointed all this out, and gave the mode of doing it, and when we do it, we use a different process from yours. I suppose the meaning of it is this, that the defenders say Lord Dundonald's process gives a gradual heating, and if you put the Torbanehill mineral, or any bituminous coal, and make it undergo that process, it will give you paraffine, and we do nothing else than use Torbanehill mineral in that sense and in that way The pursuers, on the other hand, say, we don't claim any particular apparatus, but if you use an apparatus which heats the coal up gradually, with the view of obtaining paraffine, then you are doing what we claim. Lord Dundonald's patent was not for the production of coal-tar, but for a certain apparatus, with a view to the producing of coal-tar. The essence of his patent was the admission of the external air, for the purpose of obtaining coal-tar, and pitch, and coke. Now, you are to say whether that was or was not an anticipation of Mr. Young. Then again, if it disclose something different, and the defenders do nothing but what Lord Dundonald disclosed, are you of opinion that they are infringing Mr. Young's patent, in doing substantially the same thing by a different apparatus, which Mr. Young does by a common gas retort? It has been said to you, that the discovery of Mr. Young is entirely dependent upon this, that a substance has been discovered, which, being treated in a mode perfectly known and used before, produces these new results—that the results are not in consequence of a new treatment of the substance, but in consequence of an old treatment of a substance that was not known before, and that nothing else but this Torbanehill or Boghead coal could produce it. That is a question of evidence for you. According to the evidence we had from scientific persons, there are various coals besides the Boghead coal, which would give this paraffine in merchantable quantities and from which it might be profitably obtained. These other cannel coals were not a new discovery in 1850. This particular Boghead, which is richer than any other, was only got at that time. Therefore, if you think that is the effect of the evidence, that there were plenty of other coals before the discovery of the Boghead, which would have been worked in this way if the Boghead had not been available, you will probably think it very difficult to say, that it was the discovery of the Boghead in 1850 that gave these results. If, on the other hand, you think there is nothing novel in this matter of the treatment of these bituminous substances so as to produce this mercantile article paraffine, in merchantable quantity, then there is an end of the case, because that would destroy the novelty, and the party cannot maintain a patent for doing that which was known before. If you are of opinion that the evidence instructs you that what was done at Wareham was substantially the same thing, and publicly done, so that parties knew that this distillation at low temperature would give it, then, of course, that was a public use of this process; if, again, you think that the mode of working which the defenders adopt in their works is not substantially the same as Mr. Young has claimed, but is substantially different, then, though they arrive at the same results in the product which they get, it is not an infringement of Mr. Young's patent. If they are working in substantially the same manner, and you are of opinion in regard to the other matters that there is novelty in Mr. Young's process, then that would be an infringement of his patent.

The Counsel for the defenders moved the Court to give several special directions to the jury; but after some explanation, the Lord President declined to do so.

The Lord President to the jury.—Then, gentlemen, you will have to make up your minds on the three issues before you. The first is, whether the defenders have used a process substantially the same as the pursuers? and the other two are the issues taken for the defenders. If upon either of the issues taken for the defenders you find in their favour, that would be a finding against the patent; but you had better say yea or nay to the several issues separately.

The jury then retired, and soon after returned with a verdict, finding unanimously for the pursuers.

The Lord President.—Upon all the issues?

Foreman of the jury.—Upon all the issues.

Copyright: Beale *v.* Green.—This was an *ex parte* in the Vice-Chancellor's Court, before Sir J. Stuart, for an injunction to restrain the defendant, who was a publisher in Bow-street, from publishing and selling an edition of the opera called "Robin Hood," such edition being alleged by the plaintiffs, Messrs. Beale and Co., of Regent-street to be a piracy of the same opera, to the copyright in which they claimed to be entitled. The Vice-Chancellor made an order for an injunction as asked.

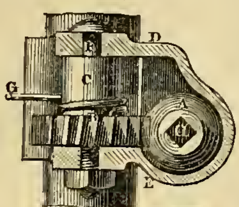
REGISTERED DESIGN.

TANGENTIAL STRAINER FOR IRON FENCES.

(Registered for Messrs. Kennan & Sons, *Fishamble Street, Dublin.)*

The purpose of utility obtained by the arrangement of this design is that of an effective and simple straining apparatus for tightening the wires, hoops, or chains, of strained iron fences. Figs. 1 and 2 of the annexed engravings, represent, respectively, a vertical and horizontal section of the tangential strainer, fitted to a pair of iron straining pillars. A, is a tangent screw working into the teeth of the worm-wheel, B, the boss, C, of which forms the barrel upon which the wire, hoop, or chain to be strained, is wound. The screw, A, and wheel, B, are both centred in a frame, made in two halves, D and E, united by the same bolt, F, which serves as the axis of the wheel, B By applying power to the screw, A, which is provided with a square socket or boss, *a*, for that purpose, the wire, hoop, or chain, may be strained to any desired extent, and retained so strained without the aid of palls and ratchet wheels.

Fig. 1.



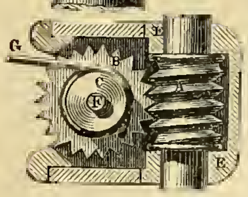


Fig. 2.

The arrangement of this design is exceedingly well adapted for carrying out the object in view, and those who require to use such an apparatus will, doubtless, be glad to avail themselves of the improvement.

REVIEWS OF NEW BOOKS.

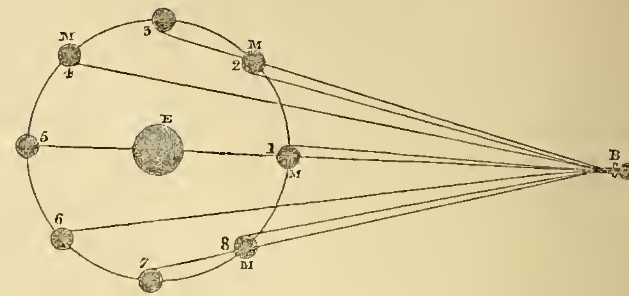
The Principles of the Working of Vulgar and Decimal Fractions and Duodecimals Familiarly Explained. By the Rev. John Evans, M.A. Small 8vo. Pp. 41. London: W. Penny. 1860.

This lucid, concise, and cheap little book,—it is published at a shilling—is a well-conceived, well executed, and well-timed assistant to the mechanical engineer. The author's intention is to enable learners, however young, to become familiar with the principles on which the rules for working Vulgar and Decimal Fractions are constructed, and to attain his end he has taken the easiest and most homely illustrations of the subject. Beginners, whether young or old, must have their early steps smoothed, and Mr. Evans has successfully accomplished the simplification of what invariably presents a mountain of difficulties to those who are new to the matter. What he now brings before us is not new, nor merely theoretical. It has been practically tested, particularly in the case of teachers in national schools. By it the pupil is first of all instructed in the principle or foundation of the rule for the "reduction of vulgar fractions to a common denominator," and shown that such a process is necessary before he can proceed to add or subtract fractional quantities. He is then led on step by step as will be seen by the following list of headings of the chapters in the volume:—Introduction; vulgar fractions; reduction of vulgar fractions; reducing fractions to the lowest terms; reduction of mixed numbers; multiplication of fractions; division of fractions; decimal fractions; addition of decimals; subtraction of decimals; multiplication of decimals; division of decimals; duodecimals; and three appendices in general illustration of some of the foregoing points. The simplicity of the author's language, and the plan upon which he builds up his instructions must commend the book to all who have need of such an assistant.

CORRESPONDENCE.

THE ROTATION OF BODIES ON THEIR AXES.

Having waited some time for an answer to my challenge to Mr. Hill and his friends, I may be satisfied it is not in their power, and not only out of *their power*, but out of the power of any man, and I assert, without fear of contradiction (I mean proof to the contrary), that the astronomical science of the present day teaches that the moon revolves round the earth in the same way that the earth revolves round the sun, but that the moon (*unlike the earth*) has no mechanical rotation upon "its own axis." Had Mr. Hill not tried to make your readers believe that nothing was more easy of proof than a mechanical rotation of the moon "on its own axis," I might now have left my opponent to solve the problem (not so "incomprehensible" to me as Mr. Hill may imagine) of twisting a cord about his own neck in his experiment. "Or, to vary the experiment, let the experimenter tie one end of a tape to his neckcloth, giving the other end to his assistant to hold loosely in his hand (upon the theory of Sir John), for every time he walks round the staff the experimenter must wind the tape once round his own neck." This experiment is the only one upon which the whole of his Fantoccini lunar exercises



are based, and carries with it (to many minds) a plausible argument in his favour. Having asserted in my letter of March, 1860, that these experiments were mere deceptions, it is only right that I should give the proof of my assertion in regard to this experiment. The paragraph above quoted states that a tape tied to the neckcloth of a man and held by an assistant *must* wind the tape once round his own neck *every time* he walks round the staff. That it must necessarily be so if the cord is arranged for the purpose is quite clear, that this proves that the man has rotated (mechanically speaking) "on his own axis" does not necessarily follow, neither does it prove that the cord must necessarily, under other circumstances, coil itself round the object, whatever that may be. The above figure will prove this without a shadow of doubt:—Let the ball, E, represent the earth, and the ball, M, the moon, the curved line the moon's orbit round the earth. Let the moon be in position No. 1, the end of the cord attached to the moon at the point facing the earth. Now, let the cord be carried back any distance (say twenty-five millions of miles to please Mr Hill) to the pulley, B, over which let it hang with a sufficient weight to keep it in its place, and length to allow one turn of the moon round the earth, or ball, E. Now, pass the ball, M, in succession from 1 to 2, 3, 4, 5, 6, 7, 8, and home to 1, no coil round the *ball*, or the *man's neck* will be the result. The cord in its movement will have touched upon the half of the moon next the earth, and *no more*. In conclusion, as Mr. Hill commenced his first letter with the mention of the late Mr. J. Symons, I may finish this by stating, I never met that gentleman, nor have I read his pamphlets connected with that or any discussion on the subject, excepting one letter which speaks of an owl which "twisted its own head off." Now, this result I take as presumptive evidence, that this owl must have been an astronomical owl, and not a mechanical one, otherwise his head would have rotated on "its own axis" without damage.

Bertram Mitford.

November, 1860.

MONTHLY NOTES.

MARINE MEMORANDA.

In addition to the large paddlewheel steamer, *Scotia*, and several screw steamers now building, the Cunard Company have contracted for a fine new screw steamer of 2,536 tons, and of considerable power, for their line between Liverpool and New York, to replace the *Etna* screw steamer, sold by them to the Liverpool, New York, and Philadelphia Steam Company.

The banks of the Leven at Dumbarton present a busy scene just now in marine engineering. Messrs. Wm. Denny & Brothers have just finished the *Kedar*, a screw steamer of 1783 tons, for the Liverpool and Mediterranean trade of Messrs. Burns of Glasgow. The *Kedar* has been fitted with geared oscillating engines of 300 horse-power by Messrs. Tulloch & Denny. The same builders have just contracted to build two other steamers of similar dimensions and power. When these are completed, Messrs. Denny & Brothers will have built for Messrs. Burns, since 1851, twenty steamers of the gross aggregate tonnage of 21,684 tons and of 4450 horse power.

Mr. Seath continues to make way in ship-building at his out of-the-way place, Rutherglen, on the Clyde, above Glasgow. He has just launched a screw steamer of 200 tons. How he accomplishes such feats in that shallow, rapid part of the river, is somewhat of a mystery to us. The same builder is about to begin upon a screw steam yacht for the Marquis of Conyngham, who had a steam yacht built at Rutherglen last year. Mr. Seath has also three small steam yachts in the river fitting out for India.

It is designed to establish a regular line of clipper ships between New York and Kanagawa, Japan. The chief promoter of this line is R. H. Gallaher, a merchant of New York, having a house in Japan. The first ship was announced to sail at an early day; between twenty and thirty passengers, and nearly one thousand tons of freight, consisting of machinery, frame houses, and assorted merchandise, having been secured for transportation on her outward voyage. Among other things depended on for a return cargo is a quantity of Japanese seed wheat, which has been ordered, and is said to be of a superior quality.

Captain Titus Sanford, the well-known pilot of the steamer *Elm City*, on the New York and New Haven line, has probably travelled as many miles by steamboat as any known traveller. He commenced the duties of his office as pilot on this route 36 years ago, and has averaged once on the route daily during this period of time. The distance being 85 miles, he has travelled during the 36 years 1,116,900 miles, which would be the distance of more than 46 times the circumference of the globe, or nearly five times the distance from the earth's centre to the moon, which is, in round numbers, 240,000 miles; and were we to make a balloon excursion to the celestial body, we know of no pilot we would sooner trust with the helm than that noble pilot, Captain Sanford. He commenced the duties of his office as pilot in the first boat of the line from New Haven to New York in the year 1824, in the boat called the *United States*, which was about the size of a Fulton ferry-boat, and was considered a splendid boat of the age.

The performance of a river steam vessel, or articulated train of barges, belonging to the Oriental Inland Steam Company, and intended to navigate the shallow rivers of the East, possesses peculiar scientific interest from the fact of this composite vessel being the longest ever yet constructed, being nearly half as long again as the *Great Eastern*. It appears that on trial this great vessel or train was found to be easily manageable, and attained a satisfactory rate of speed; and its success solves the important problem of how to carry a very large cargo on a very small draught of water, against a rapid stream. The train consists of a steamer and five barges, of the collective length of 900 feet. But these barges, instead of being towed asunder like common barges, are joined to one another by circular joints like a hinge, so that they constitute one long flexible vessel, with only one bow and one stern. The purpose of this arrangement is to obtain the necessary displacement with small resistance, and without the risk of damages should the vessel get aground, and all these conditions are effectually fulfilled by the arrangements adopted. The train is 30 feet broad and about 7 feet deep. At a draught of water of about 3 feet it will carry about 3000 tons of cargo. Such a vessel is greatly needed at the present moment to carry up railway materials in India, and to bring down cotton, flax, and other articles of agricultural produce.

The money already expended on the Birkenhead Docks amounts to £749,093. Of this sum £103,191 has been expended on the low water pier; £256,719 has been laid out on the great float; £60,720 on the restoration of walls; £14,895 on the Morpeth Dock; £45,878 on the northern entrances. On the Graving Docks, £24,217 has been expended; on the river wall, £46,724; on the Woodside enclosure, £23,754; on the Seacombe sewer, North road, and other works connected with it, £36,345; repairs to old sewer, &c., £10,844; on engines, machinery, &c., £85,808; and the stock in hand is estimated at £40,000. Of this large sum, £275,759 has been expended during the present year, the low-water basins alone having cost £48,000. On the Liverpool side there has been expended on the new works for the carrier's dock, £28,779, of which £19,312, has been expended since the 1st of January, 1860. On the Canada half-tide basin, £59,956, of which £47,964 has been since the beginning of the present year. On the branch steam dock, £27,905, of which £22,504 has been expended since the 1st of January last; the total expenditure on the Liverpool side since the commencement of the present year has amounted to £89,782.

We now have some rather more cheering news as to life-boats on our Scottish coasts. A benevolent gentleman resident in Edinburgh has just communicated to the National Lifeboat Institution his intention to defray the cost, amounting to upwards of £500, of a complete first-class lifeboat station, including boat, stores, transporting carriage, and boathouse. The station, will, at his request, be established on the Mull of Cantire, on the west coast of Scotland, where some fearful shipwrecks, with loss of life, take place nearly every winter, six wrecks having occurred in that neighbourhood during the past 12 months. Being mounted on a transporting carriage, the lifeboat can easily be made available for all accessible points round that peninsula. The donor stipulates that the establishment shall hereafter be kept up in an efficient state jointly by the National Lifeboat Institution and the residents of the locality. A lady resident at Lasswade Bank has also promised the Lifeboat Institution to pay the cost (£200) of a new life-boat, to be planted at Irvine, which is likewise situated on the west coast of Scotland. Last February a frightful wreck of a French vessel, named the *Succès*, of Nantes, occurred on the Irvine Bar, when every one of her unfortunate crew perished, from the want, as it was believed, of an efficient lifeboat. The institution forwarded, a day or two ago, a new lifeboat and transporting carriage to Thurso, in the extreme north of Scotland. The cost of the boat is the munificent gift of Mr. A. H. Jaffray, of St. Mildred's Court. He also defrayed the cost of the St. Andrew's lifeboat, which during the heavy gale of the 3d inst., rendered important services to several fishing boats from Buckhaven. Their crews have subsequently sent, with expressions of much gratitude, £3 to help to defray the cost of the maintenance of the lifeboat. Mr. Jaffray has also, in conjunction with his father, paid the expense of the lifeboat which the society sent about a month ago to North Berwick, near Edinburgh, where, again, four or five poor creatures perished last winter from a wreck, through the want of a lifeboat. The institution has another lifeboat, the gift of a benevolent lady, ready to be sent to Buckie, an important fishing town in the north-east of Scotland, near which place three or four years ago 42 poor fishermen perished. The institution has now lifeboats at the following places on the Scotch coast:—Ayrshire, Ayr; Caithnessshire, Thurso; Banffshire, Buckie and Banff; Elginshire, Lossiemouth; Aberdeenshire, Fraserburgh; Fifeshire, St. Andrew's; Haddingtonshire, North Berwick. It is a singular circumstance that nearly every one of these boats is the gift of private persons, who, with one or two exceptions, have no connection with Scotland. After a lifeboat has been established in a locality it is estimated that about £40 a year is required to keep it in an efficient state and ready for instantaneous use.

Reciprocating Stair-Way or Lift.—This is a contrivance introduced by Mr. Hoffs, an American engineer, in which two platforms are arranged to rise and fall by means of screws worked by belts from one landing to the next, pausing at each long enough, say ten seconds, until the passengers can step from one to the other. The edges of the platforms upon the open or entering side, as well as that of the landing, are hinged to prevent any part of the person being caught between them. This apparently coincides with the idea of the man-lift introduced some years ago into the mines of Cornwall, to get rid of ladder-climbing.

Low Water Detector for Steam Boilers.—A recent American invention, by Mr. E. H. Ashcroft, for keeping the boiler water level right, consists of a tube attached to the boiler, just below the water level, extending vertically to a convenient height, and surmounted by an air-vessel. Just below the air-vessel projects a branch which contains a union-joint arranged to receive a disc of fusible alloy; beyond the disc is a steam-whistle. In the vertical tube is placed a cock, which is intended to prevent the continued escape of steam. The operation of the apparatus is as follows:—After the boiler has been filled to the water-line, and put in action, the pressure of the steam forces the water up through the instrument into the air-chamber, compressing the air therein and filling this chamber to a greater or less extent, according to the pressure. There being no circulation through the apparatus, so long as the lower end of the tube remains *under* water, its contents will be of a comparatively low temperature, and the disc will remain solid. But whenever the water in the boiler falls *below* the end of the tube, the steam immediately displaces the water in it, and melts the fusible disc, and, rushing out through the opening, gives notice through the whistle that the water is falling to a dangerous point. To replace a disc, the cock is opened cautiously until the water reaches the opening at the top, the cock is then shut, and when the water above it has become cool, the disc may be replaced with safety, and the cock fully opened.

Railways and Telegraphs in France.—The total length of lines conceded by the French Government extends to about 10,000 miles, costing 7 miliards of francs, of which the State furnishes 900 millions. The amount already expended is 4350 millions, of which 750 millions are by the State. The length of lines at present working is about 5700 miles, spreading over 74 Departments, and serving 65 principal towns, including 30 seaports, besides an infinity of smaller places. There are in all 3000 locomotives and tenders, 7000 carriages, and 60,000 waggons of various kinds. 70,000 persons are employed on the railways. The following are quotations of the present value of stock of the different French railways:—

Paris and Orleans,	500 franc shares	...	1387 francs.
Northern,	500 „	...	981 „
Eastern,	500 „	...	608 „
Lyons and Mediterranean,	500 „	...	908 „
Midi,	500 „	...	517 „
Western,	500 „	...	567 „

The arrangements for the Franco-American electric cable are going on rapidly. The *concessionnaires*, Messrs. Rowett & Co., entertain no doubt of the complete success of the undertaking, and the Emperor takes a great interest in it, disposed, apparently, to grant every facility. The cable, from its peculiar construction, will be extremely light in water, and the greatest danger, breakage in laying down, will be avoided.

The Manchester Association for the Prevention of Steam Boiler Explosions.—The usual monthly meeting of the Executive Committee was held on the 30th October, at the offices of the Association. Mr. H. W. Harman, C.E., chief inspector, presented his report, from which the follow are extracts:—"We have made 339 visits, examined 842 boilers and 649 engines. Of these 3 visits have been special, 4 boilers specially, 9 internally, and 31 thoroughly examined; 9 cylinders have been indicated at ordinary visits. The general defects are as follows:—Fracture, 5 (3 dangerous); corrosion, 14 (5 dangerous); safety valves out of order, 43; water gauges ditto, 24; pressure gauges ditto, 9; feed apparatus ditto, 6; blow-off cocks ditto, 23; fusible plugs ditto, 5; furnaces out of shape, 12; blistered plates, 2; Salters inoperative or screwed fast, 6; total, 149 (8 dangerous); boilers without glass water gauges, 24; ditto pressure gauges, 8; ditto blow-off cocks, 34; ditto back pressure valves, 78. Among the remaining defects are one or two that demand special notice; for instance, I often find back pressure valves fitted between the feed pump and the regulating valve on the boiler. This is wrong, seeing that the object in view in applying such valves is thereby frustrated. All back pressure valves should be fixed to the boilers, and be the last thing through which the water should pass; when, if they are properly fitted, they will, by closing through any return action, act effectually in preventing any escape of the water should any accident happen to the feed pipes. Another circumstance I desire to allude to is the manner often adopted of securing the standards or fulcrums or safety valve levers. These are often screwed into a cast-iron flange or projection, of not more than ¾ inch to 1 inch in depth, and as the whole strain of the resistance to the valve pressure has to be sustained by these standards, it follows that very great danger attaches to this plan of securing them. Cast-iron threads can never be relied upon, and every time the levers are raised to test the valve's action a sudden strain is thrown upon this fragile fixing. Deep lugs should always be cast upon the valve boxes, and the standard should pass through them and be well secured with a nut underneath. I cannot omit mentioning a case we have met with this month, where two safety valve levers were found fixed fast in the guide standards, by means of iron wedges having been driven in to keep down the valves on their seatings, as they were subjected to 'blowing.' Anything more imprudent cannot well be conceived; the valves were rendered totally inoperative, and with a pressure in the boiler of 50lb per square inch the danger became imminent."

A Suspension Bridge 3000 Feet Long.—Mr. Peter W. Barlow, civil engineer, of Great George Street, Westminster, having visited America for the purpose of carefully examining the construction of the Niagara Railway Suspension Bridge (the strength and durability of which have been much questioned by English engineers), has returned with so high an opinion of bridges of this kind that he proposes their immediate adoption for several extraordinary purposes. In the first place he proposes to connect Liverpool with Birkenhead by such a bridge, 150 feet above the level of the river, at an estimated cost of £1,000,000 sterling. Passengers are to be raised to the level of the bridge at one end and lowered at the other by steam power. The span of this immense bridge would be no less than 3000 feet. Mr. Barlow proposes to suspend a similar bridge from New York to Brooklyn, with a span of 2000 feet. He likewise advocates the construction of a suspension girder viaduct for the purpose of relieving the street traffic of London. Two lines of communication—one from east to west, and the other from north to south—would go far, he says, towards effecting the object, one commencing at the junction of the Tottenham Court Road and Oxford Street, passing at the back of the Bank to Whitechapel; and the other commencing at the Elephant and Castle, where the Kent, Newington, and Walworth roads unite, to a point near the Shoreditch Station of the Eastern Counties Railway. The cost of a wire suspension girder viaduct, with a span of 1000 feet, would not exceed for a double-line of street omnibus traffic (in connection with the expected street railways, which will converge at the above-described terminal point) £150,000 per mile to meet fully the requirements of the Board of Trade. The only land required will be for the wrought iron towers, as a wire bridge may be erected without the least interference with the intermediate property. Allowing £100,000 per acre (the average cost of the terminus of the South-Eastern Railway) for the land required, or £50,000 per mile, the whole scheme may be carried out for a little above £1,000,000. He further suggests the adoption of wire suspension bridges where bridges have been long projected and abandoned from their cost and interference with property, as hitherto proposed. As an example, he proposes to connect Holborn and Newgate Street by a level bridge, and thus avoid Holborn Hill. A wire suspension bridge with towers of wrought iron, constructed like a vertical lattice beam, would offer little obstruction to the light, and would not exceed in cost the sum of £75,000. As another example, he would cross the Mersey at Runcorn with a similar bridge (where Telford projected a chain suspension bridge in the year 1814), having a centre span of 1000 feet, with two side spans of 500 feet. The construction of a chain bridge of these dimensions in 1814 was as much at variance with previous notions, and presented as much apparent difficulty, as a wire bridge now presents of 3000 feet span, from the superiority of wire over chains, which is so manifest, not only from its greater tenacity, but from the facility of erection, that large chain bridges will probably never again be executed. The cost of a bridge at Runcorn, either for road or railway, with a section of metal such that the strain produced by the greatest weight will not exceed one-fifth of the ultimate strength of every part of the bridge, will not exceed £100,000, and responsible contractors will be found, Mr. Barlow engages, to execute the work for that sum, and probably much less. We thought we had arrived at the end of the extension of the size of bridges, but Mr. Barlow out-tops all previously proposed structures of the kind. How does he propose to get over the difficulties arising from a strain upon hearing chains of 3000 feet without any supports in the bed of the Mersey? and if these are required how will he construct them?

Monster Banker's Safe.—An iron safe of extraordinary size has just been completed by the well-known firm of Milner and Son of the Phœnix Safe Works, Liverpool. This specimen of workmanship, is, we believe, unique as regards size, its dimensions are, frontage, 13 feet, depth from front to back, 19 feet, height, 10½ feet. The outer walls of the safe are constructed of 45 great iron slabs, half an inch in thickness, 10 feet 6 inches high, and 2 feet 6 inches broad. A hollow space of 1 and a half inch intervenes between the outer and inner walls. The "inner walls," while adding to the strength of the safe, give it the quality of resisting fire, for they consist of a series of 30 chambers, constructed in the manner common to all Messrs. Milners' safes, and fitted with the composition which keeps the interior of the safe cool while its exterior may be exposed to the fiercest conflagration. These chambers, or inner walls, are 4½ inches in thickness, and the "roof" of the safe is of precisely similar construction. The same precautions against fire are not necessary with regard to the flooring, which will rest on a solid stone basis, but in order to knit the framework of this remarkable edifice together and give it proportionate strength, the floor consists of two thicknesses of iron plates. The interior of the safe is divided into two compartments by an iron partition furnished with a pair of folding doors which give access to the inner room or bullion chamber, which is 12 feet wide by 10 feet deep. The outer compartment is enclosed by two pairs of folding doors, so that if a felonious attempt is made to gain access to the inner room where the gold coin will be deposited, three powerful banker's safe locks must be destroyed before a coin can be reached. These are obstacles that we apprehend, not even the most desperate characters would care to make an attempt upon The safe has been constructed for the Commercial Bank of Mauritius, and it is to be hoped, after so much labour has been expended upon it, that it will reach its destination in safety. Its construction certainly reflects great credit upon the makers, and will add to their well deserved fame.

Aitken's Improved Clocks.—Mr. James Aitken, of Dalry, Ayrshire, watchmaker, has recently obtained protection for a new invention relating to the arrangement and construction of clocks or timekeepers, and it is more particularly adapted for turret or other clocks where the necessary depth or amount of space for the length of the pendulum cannot be conveniently obtained. It happens not unfrequently in churches and other public buildings that the architectural arrangement of the spire, tower, or other part where it would be desirable to place a clock, will not admit of the necessary space below the clock for the movement of a pendulum of sufficient length; also, in ordinary eight-day time-keepers, the convenience of being enabled to reduce the length of the case is of much importance. According to this invention, the back fork or crutch which imparts momentum to the pendulum is fitted on the pallet or bar with the crutch extending upwards, or in a direction the reverse of that in which it has been hitherto employed. The crutch is prolonged beyond the pallet or bar in a downward direction to serve as a counterpoise weight, keeping the upper part in a vertical or balanced position, and so that it will not fall over either to the right or left until acted upon by another force. The point of suspension of the pendulum is raised at least the length of the upper part of the crutch above the crutch, and, consequently, places the point of suspension at least twice the length of the crutch higher than in the usual way. In practice, this improvement has been found to perform most accurately, and to fully answer the patentee's expectation. There are numerous public clocks where its application would be of the greatest service and utility. At a future time we shall report the invention fully.

The Late Mr. Condie.—Another valued contributor to the national wealth has suddenly passed away from us, in the person of the patentee of the moving cylinder steam hammer. About half-past eleven in the forenoon of the 1st of November, Mr. Condie, accompanied by a friend, entered Messrs. Ogle's, of Exchange Square, Glasgow, booksellers, where he was in the habit of frequenting almost daily, for the purpose of viewing a portrait of the late Mr. Andrew Storie Ogle, writer in Glasgow, who died in August last. The portrait was lying in a small room off the shop, and Mr. Shaw, of Messrs. Ogle's establishment, had just placed the picture upon a chair for Mr. Condie and his friend's inspection, when the former, who was standing close to Mr. Shaw, suddenly dropped down, falling backward into the empty fire-place. Mr. Shaw lifted Mr. Condie from the place where he had fallen, and laid him upon the floor, while he supported him in his arms. Only a few seconds elapsed, when Mr. Condie, after one or two slightly convulsive movements, expired without having uttered a word. Dr. Watt and another medical gentleman were speedily in attendance, and found life to be extinct. The deceased gentleman was not known to have been complaining of illness previous to his decease. Mr. Condie was a native of Glasgow, born in Kirk Street, Gorbals, on the 10th May, 1799, his parents being in the humblest rank of life, and was the eldest of three sons. He received the rudiments of an ordinary education at one of the schools in the vicinity; and, when a mere child, evinced an aptitude for, and delight in, mechanical subjects, by standing for hours observing the labours of a watch and clockmaker in the neighbourhood. At an early age he was apprenticed to a cabinetmaker, and proved himself one of the best workmen in his trade, the knowledge thus acquired proving of great advantage to him in his future career. When about twenty years of age he re-constructed an organ for a choral society in Glasgow entirely with his own hands, which, we understand, is still in use in one of the Catholic chapels in Greenock. Having attracted the attention of Dr. Ure, Professor of Chemistry and Natural Philosophy in Anderson's Institution, he was elected his curator and assistant, where, being entrusted with the charge of numerous scientific models and the construction of others to illustrate the learned Professor's lectures, full scope was given to his talents, and we believe he never filled any situation with greater pleasure. Mr. Condie was afterwards engaged as manager of Calder Ironworks, and during his residence there, designed the apparatus for heating the air for the blast furnaces, and invented the water tuyere in connection with the same, without which the adoption of the hot-blast patent of Mr. J. B. Neilson was too costly to prove of any practical benefit to the iron trade. The introduction of the water tuyere having at once proved the value of Mr. Neilson's invention, was immediately adopted by the ironmasters throughout the kingdom, and had it been patented by Mr. Condie, would at once have rendered him independent. About the year 1843 he entered into partnership with two gentlemen in Glasgow, with the intention of manufacturing wrought iron nails on an extensive scale, with machinery invented for that purpose by Mr. Reynolds, an American gentleman; but after spending several years in experiments, during which he entirely remodelled and considerably improved Mr. Reynold's machinery, the enterprise was abandoned. On the discovery, by Daguerre, of the photographic process becoming known, Mr. Condie was one of the first in this city to take up the subject, which he entered into with all the enthusiasm of his nature, and many beautiful specimens of his skill as a photographer are scattered amongst his friends. In 1846, Mr. Condie was appointed consulting engineer to the late William Dixon, Govan Ironworks, Glasgow, and his attention was then directed to the improvement of the machinery employed in the manufacture of malleable iron. The rude and expensive system of hammering iron with metal helves led him to suggest the introduction of the Nasmyth steam hammer in their stead; but this being objected to on account of the many breakages to which, from the principle of their construction, they were liable, led him to investigate the subject and see how these could be avoided. The result was the production of his "Patent Moving Cylinder" steam hammer. The first hammer on Condie's principle was put in motion in February, 1848, and exceeded the most sanguine expectations of the inventor and his friends. This patent also included the passing of a stream of cold water through the anvils and hammer faces of steam and helve hammers, being a useful and ingenious application of his water tuyere, whereby these parts were preserved from the great heat they were subject to. In 1853 he erected one of the largest steam hammers in Great Britain, in the Lancefield forge, where he had formerly been manager; and this hammer, on account of its gigantic proportions and great width of framing, was selected several years afterwards to forge the immense masses of wrought iron required for the engines of the *Great Eastern*. The eminent engineer, Robert Stephenson, called on Mr. Condie in 1852, and after watching for some time the ponderous tool compressing the masses of red-hot iron into the required shape, turned to him with the remark:—"I wish that was my invention;" and this compliment, we know, Mr. Condie prized more highly than all the others which had so often been paid him. The great success which attended the introduction of his steam hammer enabled Mr. Condie to retire from active life about six years ago, and the evening of his days was spent in the quiet leisure which he had so well earned.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded July 25.

1810. Thaddeus Fowler and De Grasse Fowler, Northford, Connecticut, U.S.—Improvements in machinery for manufacturing pins.

Recorded July 31.

1854. Adam Dixon, Birmingham, Warwickshire—Improvements in knife cleaning machines.

Recorded September 11.

2190. George Wellman, Lowell, U.S.—Improvements in carding engines, for carding cotton and other fibrous materials.
2198. Gilbert L. P. Coopman, Constantine (Algeria)—New means and processes of tanning hides and skins by which a graduated impermeability of leathers is obtained.

Recorded September 12.

2200. Benjamin Baillie, Henry Street, Cumberland Market—An improved rifle range.

Recorded September 13.

2208. James Wright, Bridge Street, Blackfriars—An improvement or improvements in the construction of boots and shoes.—(Communication from Lyman R. Blake, Abingdon, Plymouth, Massachusetts, U S.)
2210. Arthur Ransford, Manchester, Lancashire—Improvements in galleries or supports for gas shades.

Recorded September 14.

2220. Charles T. Lannay, and Auguste M. A. D. de Vernez, Paris—Improvements in treating coal-naphtha, and in apparatus employed therein.
2228. Paul Pautard, Castres Tarn, France—An improved apparatus for supplying air to persons in water, and in mines or other places.—(Communication from Benoit Rouquayrol, Firmy, France.)
2230. Joseph P. Dusterwald, Ixelles, near Brussels, Belgium—An improved forcing pump for raising beer and other liquids.
2234. Nathaniel R. Hall, Northfleet, Kent—Improved apparatus for winding up clocks or timekeepers.

Recorded September 15.

2238. Alfred Tronchon, Rue Ste. Appoline, Paris, and South Street, Finsbury—Improvements in constructing iron and cast-iron dwelling houses.

Recorded September 17.

2257. George F. Smith, Golden Square—Improvements in the smelting of iron and other ores.—(Communication from Robert W. Siever, Hamburgh.)
2259. John Hay, Salford, near Manchester, Lancashire—Improvements in machinery or apparatus for making gas burners.

Recorded September 18.

2266. Edward J. Hughes, Chancery Lane—Improvements in brewing malt liquors, and in apparatus employed therein.—(Communication from Joseph C. Hayndrick-Percy, Saint Nicolas, and John F. Vendenhove, Ghent, Belgium.)
2268. William Collis, High Street, Homerton, Hackney—Improvements in stoppering or closing bottles, jars, and other like vessels.
2272. Rees Reece, Llandilo, Carmarthen—Improvements in treating lignite and certain bituminous mineral substances, so as to obtain products therefrom.

Recorded September 19.

2278. Robert Crawford, Beith, Ayrshire—Improvements in apparatus for conveying communications from one place to another.

Recorded September 20.

2284. David Jones, Machen, Newport, Monmouthshire—An improved method of, and apparatus for, raising water and other liquids.
2286. John Oldham, Derby, Derbyshire—An improvement in machinery for pulping turnips and other roots.
2288. Robert Kunstmann, Manchester, Lancashire—An improved apparatus for lubricating the frictional surfaces of machinery.—(Communication from Thomas Rominger, Hof, Bavaria.)
2290. Victor H. Laurent, Plancher-les-Mines, Haute Saone, France—Improvements in machinery or apparatus for forging nails, screws, bolts, rivets, and railway spikes.
2292. John Cash, and Joseph Cash, Coventry—An improvement in the manufacture of frilling to be applied to wearing apparel.
2294. James Cocker, Liverpool, Lancashire—An improved construction of packing case.
2296. Thomas Richardson, Newcastle-upon-Tyne, and Manning Prentice, Stowmarket, Suffolk—Improvements in treating phosphoric matters, and in obtaining products therefrom.
2297. Joseph R. Morley, Woodbridge, Suffolk—Improvements in the manufacture of baking-dishes.
2298. Robert Mushet, Coleford, Gloucester — The manufacture of a new or improved metallic alloy.

Recorded September 21.

2300. David Murray, Norwich, Norfolk—Improvements in means or apparatus used in weaving.
2301. Calvin B. Rogers, East Street, Red Lion Square, W.C.—An improved floor skate.—(Communication from Rueben Shaler, Madison, New Haven, Connecticut, U.S.)
2302. Auguste A. Trinquier, Paris—Improvements in surveying instruments.
2303. Robert Smith, Islington, Finsbury—Covering of iron, wooden ships, yachts, steam boats, and barges bottoms and outsides.
2304. John Fisher, Carrington, Nottingham—Improvements in machinery or apparatus for treating clothes and other articles whilst in a wet condition, for the purpose of drying or partially drying the same.
2306. Henry E. Skinner, and William H. Miller, Shadwell—Improvements in cranes and other lifting apparatus.
2308. William E. Newton, Chancery Lane—Improvements in rotary engines and rotary pumps.—(Communication from Kenyon Cox, and Theodore Cox, New York, U.S.)

Recorded September 22.

2310. Thomas Fallows, Farnworth, and Richard Wild, Bolton le Moors, Lancashire—Improvements in fasteners for window sashes.
2312. John Tomlinson, Nottingham—Improvements in fire-engines.
2314. Robert Ash, and Joseph L. Petit, Birmingham, Warwickshire—Improvements in metallic pens and pen-holders.
2316. Joseph H. Tuck, Great George Street, Westminster—Improvements in air pumps, and in machinery for actuating the same.
2318. Edward B. B. Barker, Bayswater — Improvements in apparatus for raising or forcing water or other fluids.

Recorded September 24.

2319. Edwin Gaskill, Sermon Lane, Godliman Street, Doctor's Commons—The application of a traversing set-off sheet to gripper printing machines of all kinds.
2320. George Parsons, Duke Street, Finsbury—Certain improvements in breaks for railway carriages.
2321. Joseph Hine, Clerkenwell—Improvements in markers for billiards, cricket, whist, or other games of skill or chance, a modification of which is also applicable for indicating years, months, days, and dates.
2322. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in machinery or apparatus for washing and wringing clothes, and similar articles.—(Communication from Josee Johnson, and Elliot Dickerman, New York, U. S.)
2323. Henry Batchelor, Southampton Buildings, Chancery Lane—Improvements in the apparatus and means employed for the production of geometric or ornamental figures or designs.

Recorded September 25.

2324. Josiah Vavasseur, Gravel Lane, Southwark, Surrey—Improvements in machinery for rolling and polishing leather.
2325. Carl Kind, George Grove, Holloway—Improvements in pianofortes.
2326. John Haworth, Thorncliffe, Old Trafford, near Manchester—Improvements in tramways for streets and ordinary roads, and in carriages for running thereon.
2327. John R. Porter, Wood Street—Improvements in axles for railway carriages and other purposes.—(Communication from Henry Porter, and William E. Jones, Bahia, Brazil.)
2328. James B. Mannix—An improved wheel to be used for carriages or other purposes.
2329. Edward Collier, Middleton Street, Clerkenwell—Improvements in respirators.
2330. William Gossage, Widnes, Lancashire — Improvements in the manufacture of certain kinds of soap.
2331. Robert Geoghegan, James Street, Brewery, Dublin—Improvements in machinery or apparatus for expressing liquids from various substances.

Recorded September 26.

3332. James Ferrabee, Phœnix Iron Works, Stroud, Gloucestershire, and Henry Ferrabee, Camberwell, Surrey—Improvements in apparatus for lighting, heating, ventilating, and cooking by gas, the part of which invention is applicable to heating apparatuses of other descriptions.
2333. Thomas S. Truss, Gracechurch Street—Improvements in apparatus for the traction and propulsion of ships, boats and other nautical vessels.
2334. William Hollis, Railway Arches, Victoria Station, Sheffield, Yorkshire—An improved composition for steel moulders.
2335. Walmsley Hargreaves, Crawshawbooth, near Rawstentall, Lancashire—Improvements in machinery or apparatus for washing woven fabrics.
2336. Charles Burn, Delahay Street, Westminster—Improvements in the tram-rails of street railways, to prevent horses slipping thereon.
2337. Charles Burn, Delahay Street, Westminster—An improved tram-rail for street railways.
2338. Friederich W. Daehne, Swansea, Glamorganshire—Improvements in extracting copper from ores.
2339. William Boulton, Burslem, Staffordshire—An improvement in the construction of potter's drying stoves and workshops, and in apparatus for preparing the clay for the moulds used by the potter, so as to render the process of drying more effectual.
2340. Joseph M'Crossan, Glasgow, Lanarkshire—Improvements in sewing machines—(Communication from George Juengst, New York, U S.)
2341. William Macnab, Greenock, Renfrewshire—Improvements in steam engines and boilers.
2342. Ludwig Buchholz, Manchester, Lancashire—Improvements in carbonizing sawdust, and other finely divided vegetable substances, and in obtaining certain useful products by such carbonization, and in apparatus connected therewith.

Recorded September 27.

2343. William F. Brown, Westgate Street, and Walter Jeffery, Eastgate Street, Gloucester—A more convenient and effectual method of attaching and securing brooches and such like articles, and for improved fastenings to be used therewith, and for other purposes.
2344. Thomas Brookes, and Thomas Adams, Birmingham, Warwickshire—An improvement or improvements in the manufacture of the joints of brooches and other similar dress fastenings.
2345. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Improved processes for dyeing or printing with certain products of aniline on cotton, and other textile matters of vegetable origin.—(Communication from J. C. Guigon, Lyons.)
2346. Joseph J. O. Taylor, Mark Lane—An improved composition for vessels, furnaces, and other apparatus to be exposed to the operation of great heat, and the effect of fluxes and the like.
2347. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in forging and rolling metals, applicable to the manufacture of wheels, spades, shovels, axles, buffers, and other articles of wrought iron.—(Communication from Messrs. H. P. Gaudet & Co., Paris.)
2348. Moritz Jacoby, and Joseph Stones, Nottingham—Improvements in the manufacture of bobbin-net or twist-lace, in bobbin-net or twist-lace machines.
2349. William Hodgkinson, New Lenton, Nottingham—Improvements in machinery or apparatus in the manufacture of figured laces made on bobbin-net machines.
2350. James Winram, Liverpool, Lancashire—Improvements in machinery for the manufacture of casks and other like vessels of capacity.

Recorded September 28.

2351. William A. Martin, and James Purlie, Old Barge House Wharf, Upper Ground Street, Surrey—An improved method of mounting and giving motion to fire-bars.
2352. Augustus F. Sheppard, Moorgate Street—An improved method of, and apparatus for, plate printing.—(Communication from E. Muggeridge, New York, U. S.)
2353. Henry Gilbee, South Street, Finsbury—An improved medicament to prevent and cure venereal diseases.—(Communication from Noel Pascal, Paris.)
2354. James Aspell, Middleton, Lancashire, and Edward Booth, and James Hurst, Tonge, near Middleton, Lancashire—A certain improvement in power looms for weaving.
2355. George H. Birkbeck, Southampton Buildings, Chancery Lane—Improvements in electro-magnetic apparatus.—(Communication from Gabriel Perrin, Paris.)
2357. John A. Callander, Springfield House, near Ryde, Isle of Wight—An improved method of hanging doors.

Recorded September 29.

2358. Charles Green, Winnington, near Northwich, Cheshire—Improvements in the manufacture of salt.
2359. William Green, Dod Street, Victoria Road, Limehouse—Improvements in refining or treating sugar and molasses.
2360. John Roberts, Upnor, Kent—An improved mode of apparatus for harvesting corn and other crops, and ventilating granaries.
2361. Alphonse Delesalle, Lillie, Nord, France—Means and apparatuses used in steam engines for expelling out of the cylinders the condensed water, and to employ this water for the ailmentation of boilers.
2362. Henry Offergeld, Eilendorf, near Aix-la-Chapelle—Improvements in drums and apparatus connected therewith, for giving motion to shafts.
2363. Arthur Warner, Threadneedle Street—Improvements in the manufacture of iron, steel, copper, lead, tin, zinc, and their alloys, and in the manufacture of coke.
2364. Thomas Robinson, Saint Helen's, Lancashire—Improvements in machinery for packing soda ash and other matters or substances in casks and other vessels.
2365. Robert Mushet, Coleford, Gloucestershire—An improvement in the manufacture of cast steel.

Recorded October 1.

2366. John Clark, William Polloek, and James Whyte, Paisley, Renfrewshire—Improved apparatus for spinning or twisting.
2367. Elizabeth Steane, Commercial Place, Brixton, Surrey—Improvements in apparatus by the use of which the drooping or guttering of candles is prevented.
2368. George Hulme, Rochdale, Lancashire—An improvement or improvements in the process of carding wool, cotton, silk, or other fibrous materials, and in machinery or apparatus applicable for that purpose.
2369. James J. Field, Holloway Place, Holloway—Improvements in condensing vapours arising from fluids evaporating in closed vessels, which invention is also applicable to the condensation of the vapours of volatile fluids during the process of distillation and for improvements in apparatus to be employed for the purpose.
2370. Charles H. Hurst, Victoria Terrace, Royal Road, Kennington, Henry Horsey, and George Baker, Bridge Street, Southwark, Surrey—Improvements in syphon and other taps or cocks employed for drawing off liquids.
2371. Michael Henry, Fleet Street—An addition to or improvement in gas meters.—(Communication from Guillaume A. F. Peyre, and Francois Barthelemy Boulevard Saint Martin, Paris.)

Recorded October 2.

2372. George Rutter, Great Guildford Street, Southwark, Surrey—Improvements in machinery and apparatus for, and in treating flax, hemp, Rheea, China grass, New Zealand flax, plantain, and all other vegetable and animal fibres.
2373. Robert Hellard, North Street, Taunton, Somerset—Improvements in reaping and mowing machines.
2374. James Parker, Lieford Road, Camberwell, Surrey—Improvements in propelling vessels by the buoyant power of steam, hot air, and vapour in combination, in rising through water.
2375. James Bullough, and John Walmsley, Baxenden, near Accrington, Lancashire—Improvements in looms.
2376. Robert Whittam, Accrington, Lancashire—Improvements in pentagraph machines used for engraving metal rollers or cylinders employed in printing calicoes and other surfaces.
2377. Bamfyeld H. F. Macnamara, Great Yarmouth, Norfolk—Improvements in the construction of floating breakwaters adapted for the facile and economic formation of harbours of refuge and other such purposes.
2378. John T. Robinson, Bradford, Yorkshire—Improvements in screw gill apparatus for combing wool and other fibrous materials.
2379. William G. Robarts, Nottingham—Improvements in machinery or apparatus in the manufacture of fabrics made on warp machines.
2380. Elizabeth Steane, Commercial Place, Brixton Road, Surrey, and Francis Palling, Esher Street, Lambeth—An improved means or apparatus for preventing candles dropping or guttering.
2381. Peter Gardner, and Andrew Lindsay, Stirling—Improvements in knives for reaping machines.
2382. Henry C. Rush, Spencer Road, Putney, Surrey—Improvements in fences for railway platforms.
2384. Godfrey Rhodes, Albemarle Street, Middlesex, and James Syme, Bishopsgate Street—Improvements in tent frames, and in rendering coverings for tent frames and other textile fabrics, and fibres, and surfaces waterproof.
2385. John Brokenshire, Bowmanville, Durham, Canada West—Improvements in pumps.
2386. James L. Norton, Belle Sauvage Yard—Improvements in apparatus used in tentering, or stretching and drying fabrics.
2387. George E. Taylor, Oatlands Mill, Leeds—Improvements in apparatus used when boiling cloth.
2388. Colin Mather, Salford, Lancashire—Improvements in machinery for shearing and singeing fabrics.

Recorded October 3.

2389. Thomas Johnson, Leicester Square, St. Anne's, Westminster—An improved tobacco pipe.
2390. Joseph Bower, and David F. Bower, Hunslet, Yorkshire—An improvement in the manufacture of iron and cast steel.
2391. Robert James, Faversham, Kent—Improvements in reaping and mowing machines.
2392. Alexander W. Williamson, University College, and Loftus Perkins, Francis Street, Gray's Inn Road—Improvements in steam engines.
2393. Joseph H. Riddell, Cheapside—Improvements in boilers.
2394. Edward T. Hughes, Chancery Lane—Improvements in healds or heddles employed in looms for weaving.—(Communication from Jean P. Bourdeliu, Lyons, France.)
2395. Richard J. Cole, Pembridge Gardens, Bayswater—Improvements in ornamenting the windows of public and private vehicles.
2396. Arthur I. Mahon, Dublin—Improvements in screw propellers, applicable also for raising and forcing water and other liquids, and obtaining motive power from the same.
2397. John W. Greaves, Port Madoc, Carnarvon—Improvements in slate dressing machines.
2398. William E. Newton, Chancery Lane—Improvements in lamps for burning coal oils, and other hydro-carbons containing an excess of carbon.—(Communication from William H. Racey, Saint Augustine, Florida, U.S.)
2399. John Robinson, Rochdale, Lancashire—Improvements in machinery, commonly called log frames, for sawing timber.

Recorded October 4.

2400. Charles Whicher, Crozier Street, Lambeth, Surrey—An improved machine for applying steam in a manner to cause direct rotation.—(Communication from Messrs. Grande, Olivieri, and Mongiardino, Turin, Italy.
2401. Charles Cowper, Southampton Buildings, Chancery Lane—Improvements in the manufacture or extraction and application of colouring matters from the products of the distillation of coal tar.—(Communication from Joseph M. A. Battalier, Avignon, France.)
2403. Louis P. Reynaud, Paris—An improved buckle.
2404. John Sootheran and John Carr, Pickering, Yorkshire—Improvements in reaping machines.
2405. Michael Jones, Lidlington Place, Camden Town—Improvements in rifles and other fire-arms, whereby to insure greater accuracy in the use of the sights.
2406. Henry Pley, Cross Street, Wilderness Row—Improvements in signal lamps.
2407. James Morris, Clapham, Surrey—Improvements in holdfasts and guide pulleys for the cords of Venetian blinds for windows.

Recorded October 5.

2408. Charles Tuckett, Bickerton Terrace, Haverstock Hill — An improved method of ornamenting book covers, which is also applicable to other purposes.
2409. Charles Callebaut, South Street, Finsbury—Improvements in sewing machines.
2410. Thomas Wimpenny, Holmfirth, Yorkshire—A certain improvement in machinery or apparatus to be employed for spinning cotton and other fibrous substances.
2411. William M'Naught, Manchester, Lancashire—Certain improvements in steam-engines.
2413. Theodore M. Richardson, Maine, U.S.—A new and useful or improved steering apparatus for navigable vessels.
2414. Auguste Brocchi, Rue Racine, Paris—An improved waterproof cement or composition.
2415. Thomas Rickett, Castle Foundry, Buckingham, Buckinghamshire—Improvements in locomotive engines for common roads.

Recorded October 6.

2416. William Clegg, Thomas Wild, and James Tomlinson, Rochdale Lancashire—Improvements in certain machines for preparing cotton and other fibrous materials.
2417. Richard M. Hands, Coventry Warwickshire—Improvements in dressing for giving lustre to silks, ribbons, and other fabrics, also to threads and yarns.
2418. William S. Parkes, West Broomwich, Staffordshire—A new or improved washing machine.
2419. William B. Caulfield, Cole Harbour, Blackwall—Slinging and raising sunken or stranded vessels.
2420. William Kennard, Southgate Terrace, Southgate Road, New North Road—Improvements in hanging window sashes.
2421. William E. Newton, Chancery Lane—Improvements in knitting machinery and in the mode of operating the same.—(Communication from the M'Nary Knitting Machine Company, New York.)
2422. Edward Westhead, Manchester, Lancashire—Improvements in generating steam and in apparatus connected therewith.
2423. John Platt, Oldham, Lancashire—Improvements in machinery or apparatus for forging or shaping cranks on bars of metal.
2424. Arthur Sargent, Peckham, Surrey—An improvement in malt liquors.
2425. William Yates, Bromley—Improvements in steam boiler and other furnaces, and in apparatus connected therewith.

Recorded October 8.

2426. Bernhard Samuelson, Banbury, Oxford—Improvements in harvesting machines.
2427. Matthew Paris, Hill Side, Wimbledon, Surrey—Improvements in fire-arms.
2428. James Henson, Parliament Street, Westminster—Improvements in the manufacture of chains for coupling or connecting of carriages, waggons, and other vehicles on railways, applicable also to various other purposes.
2429. David Cope, Liverpool, Lancashire—Improvements in drums, kegs, casks, and like packages, and in machinery or apparatus employed in the manufacture of the same.

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 27th September to 16th October, 1860.

Sept. 27, 4293 Thomas Drayton, 1 Holford Square, Pentonville, N.—"Porte monnaie."
Oct. 2, 4294 William Newzam Nicholson, Newark-upon-Trent—"Improved sack lifting or raising barrow."
„ 4, 4295 Gower and Adley, Calcutta—"Railway whistle and carriage key."
„ 6, 4296 John Mecormack, 8 Caroline Place, Mecklenburgh Square, W.C.—"A plate to be fixed to the heels of boots and shoes, to be called the revolving metallic heel plate."
„ 16, 4297 George Gibson Bussey, Dunn's Passage, 485 New Oxford Street, W.C.—"The volunteer's canteen or refreshment case."

NOTICE TO CORRESPONDENTS.

Owing to the length which our Law Report of the Paraffine case has extended, we are obliged to let several papers stand over until our next issue. These papers include several Law Reports, Reviews, Marine Memoranda, and Monthly Notes, all of which, however, will appear in the January part.

ON THE EXPANSION OF METALS AND FLUIDS AND THEIR RELATION TO THE PROPERTIES OF STEAM.

I.

In proceeding to examine this important question, it will be necessary that we proceed on clear experimental deductions, leaving as little to speculative theories as possible. Past experience enables us to perceive that we have trusted too much to popular theories, instead of resting on clear fundamental principles. It would be well if we could forget much of the past theories, as there is no doubt they have stood in the way of a clear perception of the science of energies.

The theory of heat is a question which has long engaged the atteution of intelligent men. more particularly from the period of the introduction of the Aristotelian philosophy, as it, at that time, assumed a few apparently fundamental principles, which have long retarded the advancement of this important science; but from the time of Galileo the principles of thermo-moleeular motions began to re-act against the Aristotelian philosophy. The Galilean principles were accepted by Bacon, Boyle, and Newton, and as time passed on, the theory was supported by Count Rumford and by Davy, who have added much to the advancemeut of this seience by their clear experimental deductions. The admission of the principles of thermo-moleeular motions have for ever set aside the hypotheses of substantial caloric, so that our theories of heat, light, and eleetricity, are daily advancing, from the fact of their resting ou clear fundamental principles. Although the theory of thermo-dynamics had considerably advanced, the honour of showing the clear relation that subsists between heat and motive power seems to have been reserved for Dr. Joule; it appeared to him that the development of heat by friction in a fluid mass would establish the relation that subsisted between heat and motive power. By means of friction on water, oil, mercury, and air, he observed the amount of mechanical power expended in raising the thermometer one degree or unit of heat; that is, the number of foot pounds of mechanical work which must be expended in order to raise the temperatnre of one pound of water, by one degree Fahrenheit: this quantity he diseovered to be 772 foot pounds to raise one pound of pressure through one foot of space. The unit of heat is that which raises the temperature of one pound of water one degree Fahrenheit. Again, if two pounds be raised one unit, or one pound be raised two units in temperature, it will be evident that the expenditure of heat is equal in both cases; that is, two nnits of heat. Likewise, if one pound be raised two fcet, or two pounds be raised one foot, the power expended or work done would be equal in both cases; that is, two units of heat or two foot pounds. If 772 be multiplied by the nnits of heat, the quotient is the mechanical power or work performed. For a detailed account see Dr. Joule's papers, *Phil. Trans.*, 1850. This important discovery in molecular physics has been styled, out of complement, Joule's equivalent, so that his name will at all times be associated with this great fundamental truth. Dr. Joule proved by similar experiments that all kinds of physical energy, such as chemical action, electricity, &c., any one of them, by its expenditure, is made the means of evolving others bearing a definite proportion to that expended, thus showing the intimate relation existing between heat and motive power.

The law dedneed from the foregoing is, that heat and motive power are mutually convertible, heat being required for its production, and by its disappearanee motive power being produced or given out in a proportion of 772 foot pounds for each degree of heat, so that a given quantity of heat may be reproduced by a constant quantity of mechanical action.

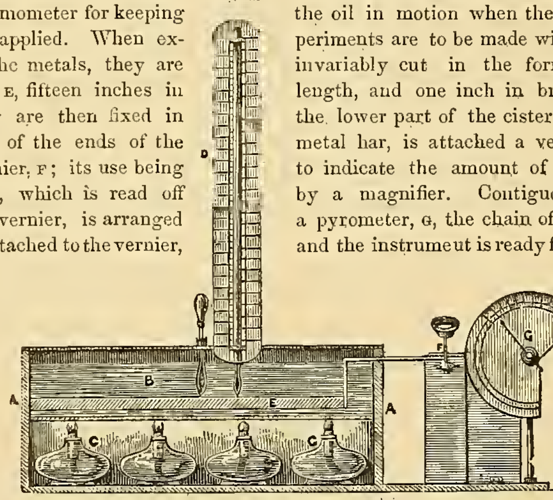
Professor Rankine, in his late valuable work on the subject, says that motion and force are the only phenomenon, the laws of which we thoroughly know, and mechanics the only complete physical science.

From recent experiments it has been determined that there is an absolute point of zero of gaseous tension, or the temperature at which air or gases would exert no physical or mechanical action; if it were possible to obtain a temperature so low, this point or zero, is fixed at 493°·2 Fahrenheit, this is assumed from 32°, the freezing point If we were to assume it from the point of greatest deusity of water, which is 39°·2, this then would make the degree of absolute zero 500° It will be apparent that there are two points given, that is the points of zero and that of greatest density. In mathematical reasoning, we say two things given, we find a third; may we not therefore iufer that if 500° be the absolute zero of cold, that 500° be also the absolute point of heat, when the dynamical energies of gases and vapours would be equally destroyed by intense heat. When we come to the question of superheated steam, we shall have occasion to refer to this more fully.

Having many years ago experimented on the properties of steam, I have been iuduced to a reconsideratiou of the subjeet, in consequence of the various speculative theories so current, in many of which little faith is to be placed. For the purpose of carrying out these observations it appeared to me that an examination of the metals and a knowledge of their general laws would assist much in the investigation of the properties of steam, as I believe that all matter is governed or regulated by the same or similar fundamental laws.

The accompanying engraving, fig. 1, represents the form of the apparatus I used for experimenting on the expansion of the metals by heat and magnetism. The frame, A, supports the cistern, B, which is made of copper, and is 16 inehes long, 3 iuches deep, and 3 inches wide. The cistern, B, is nearly filled with oil, which is heated by the lamps, C, arranged beneath in the frame, A. A thermometer, D, is fixed to the side of the cistern, so that its bulb is immersed in the oil. There is also a small agitator arranged at the side of the thermometer for keeping the oil in motion when the lamps are applied. When experiments are to be made with any of the metals, they are invariably cut in the form of a bar, E, fifteen inches in length, and one inch in breadth; they are then fixed in the lower part of the cistern. To one of the ends of the metal bar, is attached a very fine vernier, F; its use being to indicate the amount of expansion, which is read off by a magnifier. Contiguous to the vernier, is arranged a pyrometer, G, the chain of which is attached to the vernier, and the instrument is ready for use.

Fig. 1.



The metals experimented on were iron, zinc, lead, and tin. We will give a minute description of the experiments with the zinc as it will serve equally for the others. Assuming the melting point of zinc to be 700°, the mean would be 350°. A strip of zinc was cut fifteen inches in length, one inch in breadth, and one-sixteenth in thickness, and was fixed in the pyrometer eistern, the cistern was then filled with linseed oil, aud all things being ready, light was applied to the five spirit lamps. In a few seconds the thermometer indicated a rising, and the pyrometer indicated contractiou to about 12° of the circle on the dial; it then turned, and at every 10° indicated by the mercurial thermometer, the point was marked on the pyrometer dial, and each succeeding division showed a considerable iucrease over that immediately precediug up to 355° Fahrenheit, after which a dimiuution of the expansion gradually took place in much the same proportiou as the increase indicated below that point. When the thermometer indicated 600° Fahrenheit, the lamps were removed, and the thermometer immediately began to fall, but the pyrometer pointer continued to go forward about 10° to 11° aud then turned but came down considerably behind the thermometer. This experiment surprised me, as I did not anticipate contraction at the beginning nor expansion at the end; not feeling satisfied, and fearing lest something might have been wrong with the pyrometer, I repeated the experiment and found similar results. The time occupied with each observation was one hour forty-five minutes, thus allowing sufficient time for a free indication of the thermometer and pyrometer; the range of the pyrometer pointer on the dial indicated 120° of the circle, *i.e.*, the range from 56° Fahrenheit to 600° by the thermometer.

This experiment clearly indicated a mean point of expansion which I had previously anticipated, the contraction at the beginning and the expansion at the end, we were not prepared for. Lead and tin were thereafter severally experimented upon, and showed results in every respect similar, but in a less degree.

Many of our works on physical science contain tables of expansion of the metals and fluids, which are all determined from 32°, the freezing point, to 212°. It will be evident that these tables cannot convey any correct idea of the expansions, as 212° is far short of even a mean point of many of them.

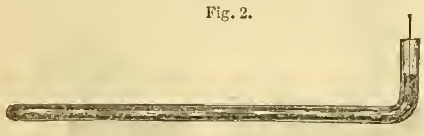
From the following experiment we perceive the close relation that seems to exist between heat and magnetism. A bar of steel, 15 inches in length, 1 inch in breadth, and ½ inch in thickness, was fixed in the pyrometer cistern, and its expansion determined the oil being at a temperature of 600° Fahrenheit. The bar was then removed, cooled down, and well cleaned; this being done, a quantity of covered copper wire was wound round it, thus forming a magnetic helix. The bar was again connected with the pyrometer and the two ends of the wire connected with the poles of the battery, the bar immediately indicated an expansion somewhat similar to that produced by heat, thus showing clearly that the molecular structure of the bar had undergone a change, as we have expansion and contraction clearly indicated; proving the close relation that exists between heat and magnetism· and there can be little doubt but that they are modifications of the same great source of power. When reflecting on these great questions of motion, the lines of Pope often pass through our mind:—

> "All are but parts of one stupendous whole,
> Whose body nature is, and God the soul."

After experimenting on the different metals, and finding the results similar in all of them, I inferred that the fluids would follow the same law. The fluids experimented on were mercury, oil, and water. The following are the results.

For carrying out the observations on the expansion of fluids, I procured a glass tube, 15 inches in length, having a bore 2·10ths of an inch in diameter, in form similar to fig. 2; this tube was filled with mercury, and in this form may be viewed as a rod of mercury. It was fixed in the pyrometer cistern; a small float in connection with the pyrometer was made to rest upon the surface of the mercury in the bent neck of the tube.

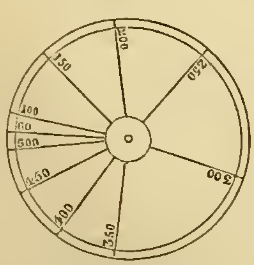
Fig. 2.



The lamps being lighted the thermometer immediately began to rise, at the same time the pyrometer was indicating contraction, but when the thermometer rose to 5° the pyrometer began also to ascend; we marked the dial at every 10° on the thermometer, and found that on each succeeding 10° the divisions on the pyrometer dial increased considerably till about 335° Fahrenheit, when a gradual decrease took place in a somewhat similar ratio to the increase formerly indicated. This experiment was made up to 500°, we could not get further, as the pyrometer pointer had passed round the dial. The time occupied was two hours fifteen minutes. The engraving, fig. 3, will convey a clear idea of the indications.

It will be observed that the distance from 100 to 150 on the engraving is much less than from 150 to 200; that from 200 to 250 is considerably greater than that preceding it, that from 250 to 300 is greater still, and that from 300 to 350 is the largest space of all; within this space is the mean point, and the gradual decrease which follows is quite apparent.

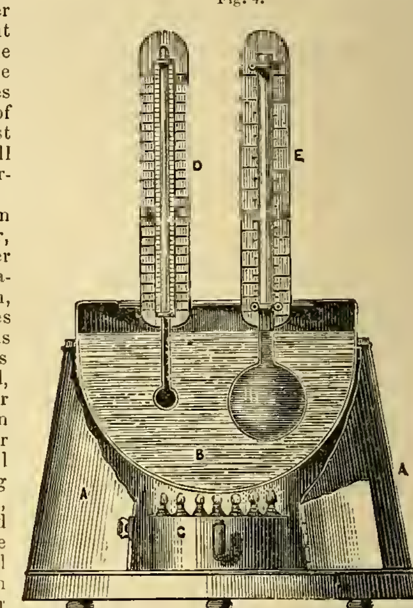
Fig. 3.



In order to verify the above important experiment, I procured a large mercurial thermometer, the bulb being 2½ inches in diameter, the bore of the stem or tube ¼ inch in diameter, and its length 10 inches. This thermometer, along with an ordinary thermometer, was fixed in the apparatus shown in fig 4, which consists of the stand, A. for holding the cistern or boiler, B, which is heated by the lamp, C. The boiler contains the ordinary thermometer, D, and the large theremometer, E. The boiler was filled with linseed oil and there was a pyrometer dial attached to the stem; from the pyrometer a small float rested on the surface of the mercury, this giving motion to the pointer on the dial. When the lamps were lighted, the mercury immediately indicated contraction by the pyrometer, while the other thermometer was rising slowly, the pointer turned and continued to increase till about 335° Fahrenheit, and thereafter decreased in a proportionate ratio. The lamps were removed when the thermometer indicated 600° Fahrenheit, and still the mercury continued to expand, thus confirming the former experiment. This experiment occupied three hours and forty-five minutes, in consequence of the mercurial bulb being so large.

The thermometer is the standard measure when heat forms a part; it is the basis of all our tables, and from its indications our deductions are formed. How far these deductions may be correct we will not at present offer any decided opinion, but there is no doubt, if the experiments which I have made be correct, our tables of heat, particularly of high temperatures, must be reconstructed, as well as the scales of our thermometers.

Fig. 4.



In our experiments on the expansion of water, the water thermometer bulb was 3 inches in diameter, the bore ¼ inch, and the stem 12 inches long; attached to it was a copper plate, 10 inches long by 1½ inches broad, so that slips of paper could be fixed between the stem and the plate for each experiment. The oil used when experimenting with mercury was removed, and the boiler well cleaned and filled with water. The water and small mercurial thermometer were fixed in the boiler; the lamps under it being so arranged that the water boiled in about sixty or sixty-two minutes, thus allowing sufficient time for the indications of the thermometers. When the thermometers were fixed in the boiler, the temperature of the water was 42°, and the temperature of the room 57°; the lamps were then lighted. The water scale was marked at every 10°, as indicated by the mercurial thermometer, so that the water scale was formed on the right hand side of the stem, and a cooling or contracting scale marked on the left hand side. By this means we could perceive the expansion and contraction of the water. The water gave the same indications as that of the metals and mercury, *i.e.*, contraction when the heat was applied, and expansion when the lamps were removed. There is another important point which is indicated more distinctly by the water, owing to its great expansive power, that is, the degree of heat marked when expanding does not coincide with the same degree when cooling—the difference being somewhat as follows:—The mark indicating 180° when the water was expanding, represented when cooling or contracting, 170°; the mark of 190° when expanding, represented 180°·7, when cooling; 200° equalled 190°; and 210° equalled 200°; thus showing that the energy of contraction is far short of that of expansion. We shall have occasion to refer more fully to this, when we have come to treat of the pressure and expansion of steam.

The question now comes to be, what are the causes which produce contraction when heat is applied, and expansion when it is removed? On this we can only offer one opinion, that is, if we accept the mechanical theory of heat, it may be explained in this way, that the particles or moleculæ of matter arrange themselves in a particular way when expanding, and re-arrange when contracting, and it is the particles so arranging themselves—if we conceive them to be of a prismatic triangular or oblong form—which cause expansion and contraction.

By the chemist it is affirmed that matter can be divided into indivisible atoms, and that each atom may have a definite form and weight. It would seem clear, if we but knew the molecular construction of matter—that is, the specific nature of the moleculæ, and the laws which bind the forces—we would then have the true key to tell the changes of the material universe. Many theories have been advanced on this important question, which we will not concern ourselves with at present; but those desirous of following it may consult our encyclopædias on the atomic theory, particularly that of the learned Italian philosopher, Boscovich, also the experiments of Mr. Grove, of London, on the theory of voltic currents.

This article will be followed by a series under these heads:—1, The mechanical properties of steam, and its economy at the various points of pressure; 2, the pressure, expansion, and super-heating of steam; 3, the feeding of boilers with cold and hot water, the causes of priming, and the means of preventing it; 4, the steam engine, its velocity, and the various methods of calculating its power.

PAUL CAMERON.

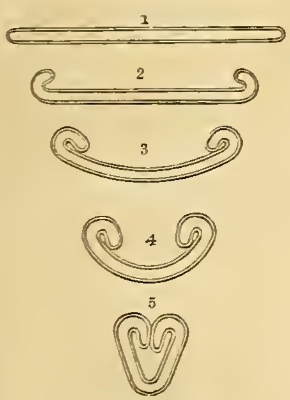
HISTORY OF THE SEWING MACHINE.

ARTICLE XXXIV.

On the 5th of September, 1859, a patent was granted to A. V. Newton, for improvements communicated to him from abroad, consisting in the formation of a lock stitch which is usually made by a needle and shuttle, by means of a revolving and vibrating arm and hook for extending the loop of the needle thread. The hook is attached to a revolving arm, and receives a vibratory motion transversely to its revolution. Another part of the invention relates to a peculiarly arranged bobbin for supplying the locking thread in lieu of the ordinary shuttle; the invention further relates to a peculiar device for taking up the slack of the needle loop between the bobbin and the revolving and vibrating hook. This invention comprises also an improved feed mechanism, consisting of one or more smooth faced angular projections, formed on the feed bar, and working into the teeth of one or more ratchet wheels, carried by the presser foot, the projections pressing the cloth forward one notch at a time, of each wheel.

C J. Parry obtained a patent on the 23d of September, 1859, for an improved apparatus for applying binding to the edges of fabrics. This apparatus consists of a flattened tube of the exact width of the binding, illustrated at fig. 230. The edges of this tube are turned in gradually towards the delivery end, as shown by the several sections, Nos. 1, 2, 3, 4 and 5, the binding being finally delivered at the mouth, which is shaped as in No. 5, and applied to the fabric with its edges properly turned in.

Fig. 230.



A patent was granted on the 12th of October, 1859, to Thomas Twells, for an embroidering machine, wherein grooved needles having one, two, or more eyes, are fixed in a spindle or needle carriage, having a rectilinear motion through the fabric.

William Tillie, obtained a patent on the 17th of October, 1859, for making sewing machines in such a manner that the breakage of the thread will stop the machine. Also for the use of clamping guides for directing the fabrics to the needle, whereby the distance of the stitches from the edge may be adjusted in one direction, and the thickness of the fabric in the other.

On the 20th of October, 1859, a patent was granted to F. Nivelle, for the general construction and arrangement of sewing machines, whereby the number and dimensions of the several parts are greatly reduced. In this machine a chain stitch or a lock stitch may be produced as desired, if a chain stitch is wanted, a needle and hook are employed, but, when a lock stitch is required, the hook is replaced by a shuttle.

Provisional protection was granted on the 29th of December, 1859, to John Henry Johnson, for an invention communicated to him from abroad, consisting of a rather complex arrangement of mechanism, for producing the helicoidal or overcast stitch, similar to glove sewing. The thread employed is to be used in short lengths or needlefuls in lieu of in a continuous length from a bobbin. This invention is identical with the one for which William Clark obtained provisional protection on the 24th of June, 1859, and mentioned in our last article.

William Jackson obtained a patent on the 31st of December, 1859, for certain improvements in sewing machines, constructed after the invention of George Hazeltine, patented October 4th, 1859, and referred to in article thirty-two. According to Mr. Jackson, the knot stitch is formed by a hook attached to, or formed on the end of the main shaft. It carries the needle thread round a reel placed vertically against the end of the shaft. The tension of this thread is so arranged as to prevent any increasing strain on the thread whilst the hook is operating thereon.

Provisional protection was granted to Thomas Proctor and Thomas Walker on the 5th of January, 1860, for an invention embracing no less than ten different heads, amongst which we may mention a mode of regulating the tension of the shuttle thread without passing it through holes, by using a bobbin with conical ends, acted upon by a spring and screw; an improved wheel feed motion; use of a bell-crank, pivoted to the machine by conical pins, for actuating the shuttle driver, and the holder of the horizontal needle, when used in forming the double loop or Grover and Baker stitch; pressing or holding down the cloth by a small roller carried by a vertical slide; use of a catch wheel on the crank shaft, so that the machine may be stopped and started without affecting the moving power; use of a centre throw crank for actuating the whole of the working parts of the machine.

John F. Dickson obtained provisional protection on the 10th of January, 1860, for an invention embracing eight heads, amongst which we notice an arrangement for sewing lock stitch or double loop or chain stitch (Grover and Baker) in a shuttle machine, by removing the shuttle and portion of driver when required for the Grover and Baker stitch, and substituting a straight needle in its place. By this means any existing shuttle machine can be made to produce the Grover and Baker stitch at will. Also, a simple and economical mode of constructing shuttles and giving tension to the shuttle thread. The shuttle is made in two parts, pointed in the direction of its length, and fastened together by a spring clasp bearing upon a pad of India-rubber or other elastic material, laid upon the projecting wire of the bobbin, such wire being placed in the centre of the shuttle. Reducing the noise in shuttle machines by inserting a pad of soft material between the ends of the driver and the shuttle.

Samuel Chatwood obtained a patent on the 2d of February, 1860, which comprises the use of a double pointed shuttle in combination with a straight needle for producing a firm and lasting stitch at each forward and backward motion, or two stitches for each double stroke of the shuttle A peculiar feed motion, whereby the cloth may be moved either transversely or longitudinally. Also, the use of a tension pulley, placed between the bobbin and the needle, round which pulley the needle thread is passed on its way to the needle.

Provisional protection was granted to John Hall, on the 3d of February, 1860, for certain improvements in sewing machines, comprising the imparting of the requisite motions to the feed, needle, and shuttle, by a cam or eccentric fixed to the under part of the machine. A rod is connected at one end to the cam, and at the other to a plate under the feeder and vertical needle; the motion thus communicated giving the necessary horizontal movement to the feeder and shuttle. The vertical motion of the needle and needle holder is obtained by a roller working in a groove on the cam above referred to, and communicating motion to a lever or arm outside, the machine extending to the needle holder, the motion thus given constituting the vertical movement of the needle and holder.

William Newton Wilson obtained provisional protection, on the 7th of February, 1860, for the use, in two needle sewing machines, of a moveable hook which takes the loop of the under thread and spreads it till the upper needle, by entering it, causes it to slip off the hook, and so completes the stitch. Also, for a single thread machine, operating by direct rotatory motion, the loop being spread by a peculiar form of rotatory hook which is pointed at one end, and split or divided at the other, thereby ensuring great certainty of action Also, the use of two hooks in a one-thread machine of different lengths. The larger hook enters the needle loop and slips it on to the shorter hook, which hook opens it in such a manner that the needle passes through it in its downward motion. Also, improved apparatus for hemming and regulating the width of hem.

On the 8th of February, 1860, George Whight obtained a patent for certain improvements, communicated to him from abroad, relating to two thread machines, and consisting in the use of a reciprocating looper having two eyes through which the under or locking thread is passed, the looper being constructed in the form of a crank, and rocking on a pin in the front of the bed-plate. It is actuated by a cam on the main shaft.

Provisional protection was granted to John Henry Johnson for an invention communicated to him from abroad, on the 11th of February, 1860, relating to discoidal shuttle machines, and partly applicable to other descriptions of sewing machines. A curved upper needle and vibrating arm are used, the needle being guided in its movements in a slot formed in the under face of the upper bracket, by which means it is kept perfectly steady when at work, and protected from lateral displacement or deflection. The discoidal shuttle is contained in a curved race, and moves in an arc, the centre of which is between the upper edge of the shuttle and the fabric.

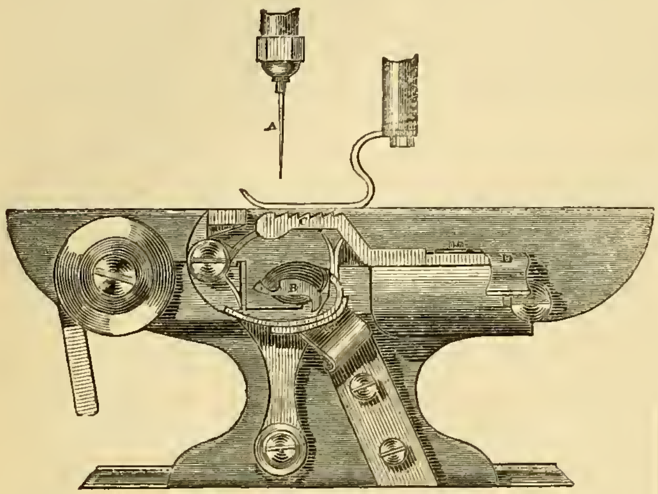
John Marsh obtained a patent on the 13th of February, 1860, which comprises, amongst other improvements, the use of a second eye in the needle at the upper end of the groove. The use of double pointed shuttles (how often has this been patented?), with circular bobbins holding more thread than the ordinary shuttle. Placing the shuttle driver on the side opposite to that where the loop is situated, and giving a sudden impulse to the shuttle so as to carry it past the needle each way. A peculiar feeder, consisting of a skeleton foot or pusher, which enables the work to be seen at the part where the needle operates. This foot holds the cloth on each side of the part being sewn, and is provided at each end with two knife-edged pieces of metal, fixed at about 45° across the same, at a short distance asunder. Also, provision for waxing the thread when desired before it enters the work.

The two next succeeding patents granted respectively to Seth Ward on the 24th of February, 1860, and to John H. Johnson (a communication from Messrs. Arnold and Price of the U. S. of America) on the 5th of March, 1860, will be found fully described at pages 208 and 198 of the present volume.

William Newton Wilson and James Pitt obtained a patent on the 5th of March, 1860, for an improved binder, whereby greater precision is obtained in the folding of the binding, with a power of adjustment in connection therewith, so that the binding may be of greater or less width on either side of the fabric, as desired.

A patent was granted to William Spence on the 21st of March, 1860, for an invention communicated to him by James Willcox, of New York,

Fig. 231.



This invention relates to a single-thread sewing machine, of a very simple but ingenious construction, and capable of producing a great variety of stitches from a single thread, by a slight adjustment of the machine. Fig. 231 represents a front elevation of this machine, with the upper bracket and needle mechanism removed. In this figure, A is the needle, B, the looper, which is in the form of a rotating hook, fitted on to the end of the main shaft. C, is the roughened feeding plate, actuated by suitable cams on a separate shaft driven by gearing from the main shaft. In producing the stitch shown by the diagram No 1, the point of the looper seizes the loop of the needle as the latter commences its upward motion, opening this loop as it revolves. The end of the looper opposite the point is rounded off, or so shaped as to allow the outward portion of the loop to fall gradually, giving the loop a half turn, so that the point of the looper will enter this bite of the thread at its next turn, the loop resting on the axis of the looper for this purpose.

Fig. 232.

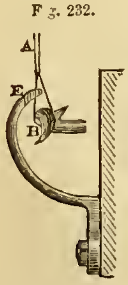


Fig. 233.

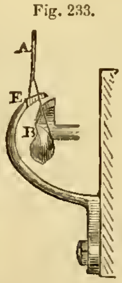


Fig. 234.

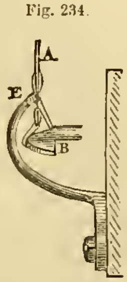


Fig. 235.

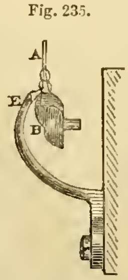
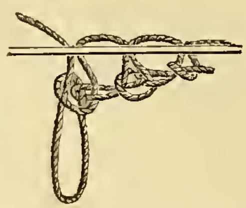


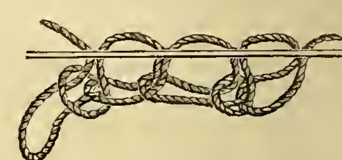
Fig. 236.

This draws the stitch through the loop already formed, and the further revolution of the looper drops or casts off the previous loop. The patentee states, that "in order to give additional security and strength to the work, the feed is rendered intermittent;" that is to say, it only moves the cloth forward at each alternate stitch, "thereby producing the stitch No. 1." The cam which actuates the feeder is made double, and one part is considerably narrower than the other. The object of this arrangement is to provide the means for making a single loop or chain stitch when desired. The change from one description of work to the other is effected by the shifting plate, n, which is so hung as to be capable of being brought either in contact with the broad portion only of the double feed cam, or upon both portions thereof. When both portions of the cam operate the feeder moves at every stitch, and at every alternate stitch only, when the plate, n, bears upon one portion of the cam, the cam shaft making only one revolution to two of the main shaft carrying the looper. A modification of stitch No. 1 is shown at No. 1*a*, when No. 1 alternates with a common chain or tambour stitch. This may be produced as well as other modifications of a similar nature, by changing the gearing for transmitting motion to the cam shaft of the feed motion, and altering the cams to correspond with the gearing and work to be done. No. 2 is another form of stitch which is produced by the joint operation of the looper above described, and a stationary hook, or point, as shown in figs. 232, 233, 234, 235, and 236. In all these figures the looper, B, is constructed to turn in the opposite direction to that required for producing stitches, Nos. 1 and 1*a*. In forming this stitch, No. 2, a stationary hook, E, permanently fixed to the frame of the machine is employed, the point or extremity of this hook being so formed and situated with reference to the looper, B, as to be capable of arresting one side of the loop as the looper passes, but at the same time so as to allow the loop to be afterwards drawn from it by the subsequent

No. 1.

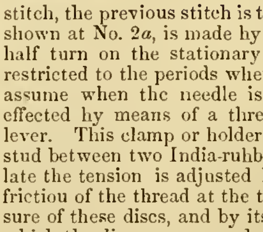


No. 1 *a*.

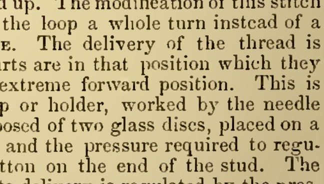


operations of the machine. In order to form this stitch, the eye pointed needle, A, is made to descend through the cloth, and when it has commenced to ascend, the rotatory looper, B, takes the loop from the needle and carries it in front of the stationary point, E, where the point of the needle, which has again commenced to descend, enters the loop, as shown in fig. 233, after which the heel of the looper, in continuing its rotatory movement comes in contact with the loop on itself, and turns it half a turn against the stationary point, E, as shown in fig. 234. When the needle has completed its downward course and has begun to ascend, the looper, B, in continuing its rotatory movement, takes another loop from the needle, and draws it through the preceding loop, as shown in figs. 235 and 236, and in drawing the thread in the operation of forming the

No. 2.



No. 2 *a*.



stitch, the previous stitch is tightened up. The modification of this stitch shown at No. 2*a*, is made by giving the loop a whole turn instead of a half turn on the stationary point, E. The delivery of the thread is restricted to the periods when the parts are in that position which they assume when the needle is at its extreme forward position. This is effected by means of a thread-clamp or holder, worked by the needle lever. This clamp or holder is composed of two glass discs, placed on a stud between two India-rubber pads, and the pressure required to regulate the tension is adjusted by a button on the end of the stud. The friction of the thread at the time of its delivery is regulated by the pressure of these discs, and by its passing partly round the pin or stud, on which the discs are secured. The delivery of the thread is restricted to the extreme upward position of the needle, by the action of a lever worked by a projection on the vibrating needle arm. The construction and form of this lever are such, that when its hinder end is at its lowest position and the needle consequently at its highest, the lever does not press against the discs, but at all other parts of the stroke, it is forced against the outer disc in such a manner as to press the discs strongly against the inner pad, and thereby increase the friction on the thread to such an extent as practically to prevent its delivery except when the needle is in its highest position. There are other points in the invention which we cannot afford space to refer to in detail, such as a peculiar mode of setting the needle in its holder so as to insure the proper direction being given to the eye thereof; a mode of preventing the machine from being turned the wrong way; and lastly, improved forms of hemmers or folders.

David Millard obtained a patent on the 22d of March, 1860, for an invention relating to certain mechanical arrangements, for effecting the feed in sewing machines, and for locking the stitches of the vertical reciprocating needle. The needle arm or lever is worked by a crank pin in a slot in the end of that lever, which is extended below the bed plate for that purpose. The motion of the feeding slide is also derived from the needle arm or lever by means of a bar attached thereto, and carrying two stud pins (one of which is adjustable) which act upon the inclined end of a vibrating lever connected to the feeding plate or slide. A looper lever is actuated in a similar manner from the needle bar. The looper which it carries is in the form of a needle having two eyes near its point which eyes are so far apart and the looper so carried between them as to afford space for the vertical needle to pass down between it and the thread, when the latter is drawn or extended from one eye to the other. The looper also passes in like manner through the loop of the vertical needle thread and thereby locks the stitches, and forms a double loop chain stitch similar to that produced by the Grover and Baker machine. Other minor modifications are referred to but they do not merit further notice here.

Mr. Millard obtained another patent on the 27th of March, the specification of which comprises amongst its essential features of novelty, the driving of the main shaft of the machine by means of friction pulleys, with bands of India-rubber or other good frictional substance stretched over these peripheries. For a description of this novelty (?) we refer our readers back to the specification of John Henry Johnson's invention in 1857, noticed at page 87, vol. v, second series. The top of the needle bar or slide is slotted vertically to form a guide for the needle thread, and projecting laterally into this slot is a loose pin, which is retained in position by means of a flat adjustable spring attached to the fixed guide, and over the face of which it moves in the up and down traverse of the slide. This pin is intended to nip the thread at certain parts of the sewing operation, and thus prevent all under slackness in the vertical needle thread. To insure this action, a stud, projecting from the flat spring above referred to, bears against the outer end of the pin and by forcing it inwards causes it to nip the thread in the slot. The feeder is actuated by a sliding inclined edged bar hooked from the needle lever direct. Simultaneously with the movement of the feeder is that of a finger, which takes up the loop formed by the looper or under needle and holds it open ready for the vertical needle to enter the loop. The finger then retires, and the needle rising, the looper will come forward and enter the loop of the needle thread. This looper is carried by a rocking lever, which receives its motion from a pin on the lever, which works the needle, moving in a slot formed in the rear end of the lever carrying the looper. The most striking feature in the machines just described is their great compactness and portability.

A patent was granted to Edwin Westmoreland and William Westmoreland on the 11th of April last, relating to shuttle machines in which the shuttle constantly revolves in a circular groove. This machine will produce either the double lock stitch or a peculiar fast knot stitch, according as the shuttle is driven in one direction or the other. Provision is also made for moving the fabric two ways without stopping the machine.

E. J. Hughes obtained a patent for an invention communicated to him from James Wilcox and Edward Howard, of the United States, on the 14th of April, the specification of which, consisting of six sheets of very heavy drawings, and a long description, is far too compendious to begin anything like a minute abstract of, but we may however just mention the heads of the invention, which are 1st, a peculiar self-acting break for instantly stopping the machine, and preventing its being rotated in the wrong direction; 2d, an improved friction pad for the sewing thread; 3d, an improved method of setting and attaching the needle to the needle bar; 4th, certain improved constructions of hemmers; 5th, an improved wheel feed motion, and means for stripping the cloth from the needle without being subjected to pressure at the part being sewed, the sewing being affected free from pressure until after it is completed and passed on to a distance beyond the needle.

A patent was granted to John Notman on the 14th of April, for an invention communicated to him by J. C. Cropper of New York. This is simply a single thread chain or tambour stitching machine, without anything very striking about it, unless it be the bad taste of its design. Only imagine the vertical or sewing needle being stuck into a female figure with a fish's tail, and the said figure bobbing, not "around," as one might have reasonably expected a "Yankee gall" to do, but up and down, being situated on the end of, and forming a part of the vibrating needle arm or lever. Then, again, there are two other young ladies of a more sedate bearing, who do *not* bob up and down, but stand in very imposing attitudes, carrying bobbins and set screws, &c. Albeit, their arms are rather inclined to be stiff, and are made after the cast-iron lever pattern; the hands, moreover, being replaced by a much more mechanical contrivance for holding a reel, to wit, a spindle. The whole may be said to be decidedly *unique* of its kind. By the way, are there any schools of design in America, and if so, are they pretty well attended?

A patent was granted to W. E. Newton, on the 8th of June last, for an invention communicated to him by Albert Gould Allen, of New York, U.S. of America. This invention relates to what we may call a "direct action" sewing machine, and consists in furnishing a sewing machine with a cylinder piston, piston rod and valves, substantially like those of a steam engine, which parts are so applied that the cylinder, piston, and piston rod constitute parts of the actual sewing machine. The vertical needle is fixed to the lower end of the piston rod, which works in an inverted cylinder, so as to admit of the machine being driven by compressed air or any other elastic fluid, or gas supplied from a conveniently arranged reservoir or generator. The fabric is fed forward by means of a rotating disc or wheel, actuated by gearing connected with the moving parts of the machine. Another part of this invention consists in providing an obliquely arranged recess in the side of the shuttle race, next to the vertical needle for the reception of one side of the loop of the needle thread, and the protection of the loop from the shuttle, which, owing to the nature of the movements, consequent upon the driving of the machine by a directly applied piston, the shuttle would be very liable to chafe and cut the needle thread in passing through the loop were such recess not provided. Another part of this invention consists in applying a turbine wheel in connection with a bobbin holder, so as to provide for the driving of the bobbin holder, for the purpose of winding the thread upon the bobbins used in the machine, by the compressed air or other fluid employed as the motive agent for driving the machine. The patentee claims as his invention, 1st, actuating the working parts of a sewing machine by means of compressed air or other elastic fluid, made to act on a moveable piston in a cylinder as described. 2d, actuating the bobbin holder by means of a turbine wheel as described. 3d, providing an oblique recess in the shuttle race for the purpose described. This very curious invention, of which we propose in a future number, giving our readers a more complete and illustrated description, terminates our "History of the Sewing Machine," and brings us down to the 8th of December, 1860, on which day the above specification was filed. Our readers have now before them abstracts more or less detailed, and illustrated by engravings when the novelty or peculiarity of the invention warranted it, of 250 inventions relating to the sewing and uniting of fabrics by machinery, and extending from the 24th of June, 1755, to the 8th of December, 1860 inclusive.

PRIZES PROPOSED TO BE GIVEN BY SOCIETY OF ARTS AND MANUFACTURES AT MULHOUSE.

Emile Dollfus' Prize.

A gold medal and 6000 francs to the author of any discovery, invention, or application, made in the preceding 10 years, which in the estimation of the society shall be considered as the most useful in the manufactures of the Haut-Rhine. If amongst the discoveries, inventions, or applications laid before the society there be none of sufficient importance to merit the prize, it will not be awarded, but in lieu thereof prizes of encouragement will be awarded in proportion to the merits of the inventions or discoveries.

Chemistry.

1st. A silver medal for the best theoretical description of the manufacture of Adrianople red. The author must explain the chemical effects of the oiling process, the subjection to sumac or gall nuts, the mordanting, dyeing, and brightening. It would be advisable that this paper be accompanied by a short historical account of the introduction of this species of dye into France.

2nd. Prize of 2500 francs, a gold, silver, or bronze medal, for the discovery or introduction of a useful process in the manufacture of printed cloths. The chromates being well known it is suggested that some other metallic salt might be found to produce advantageous results. The points upon which special attention is called are:—1st, an economical method of producing the same effects as soap upon madder colours by the adoption of some cheaper material; 2nd, the application to cotton fabrics of a new colouring matter capable of resisting weak acids and alkalies; 3rd., the introduction into the department of the Haut-Rhine the cultivation on an extended scale of any plant or insect suitable for the dyeing of wool, silk, or cotton, and which has hitherto been imported from abroad or from some neighbouring department; 4th., the discovery of a vegetable decoction of a green colour capable of resisting the action of solution of tin and suitable as a dyeing colour *(vert d'application)* for cotton linen and silk; 5th., the discovery of a means of shortening the time required in the oiling of fabrics or hanks of cotton used in in the manufacture of Adrianople red.

3rd. A gold medal for a metallic alloy suitable for the manufacture of "doctors" for printing rollers, which will combine the elasticity and hardness of steel with the property of resisting the action of colours containing large quantities of solutions of copper and iron; or the preventiou of the chemical action of colours upon steel "doctors" or scrapers by some galvanic or other process. The "doctors" composed of alloys hitherto used as substitutes for steel scrapers in printing with colours highly charged with solutions of copper or of iron, have been found to resist the action of those colours well enough, but are at the same time too soft and inelastic, and become rapidly worn by the action of the rollers, whence graver objections arise than from the simple use of steel scrapers.

4th. A gold medal to any one who shall supply to the manufactories of the Haut-Rhine a minimum weight of 2000 kilogrammes, or equivalent, of powdered madder roots, gathered the same year in any one estate in Algeria. A silver medal will be given to the supplier of half the above quantity. The invoices must be accompanied with certificates signed by the local authorities, verifying the production of the madder sent.

5th. A silver medal for a more certain and practicable mode of ascertaining, 1st, the adulteration of oils; 2nd, the nature of mixed oils; 3rd, the proportion in which such mixture has been effected. The process should be of simple execution, not only for the chemist, but of any one engaged in the buying of oils. The Society attach great importance to this subject, and would wish to draw the special attention of chemists to the testing of oils of commerce.

6th. A silver medal for the most important improvement in the bleaching of wool. The bleaching of wool is considered to be still very imperfect, the repeated processes to which the wool is subjected scarcely suffice for the removal of the grease and reduction of the colouring matter, without actually removing such colouring matter. The processes must be applicable to all qualities of wool, without the process of bleaching, by which a false white is obtained. The wool must stand a vapourising of an hour's duration, and must not be destructive of the printing colours.

7th. A silver medal for the best paper on the bleaching of cotton cloth. The author will have to find out more expeditious and economical processes. He should also endeavour to determine the degree of solubility of the colouring matter of cotton in dyes of different strengths, and in soaps, from 60 up to 181 degs., and at a temperature of ten atmospheres He should point out up to that degree how the solubility progresses, and conclude by mentioning the most favourable temperature for bleaching. Certain manufacturers use a system of dyes at high pressure in expensive and dangerous apparatus. It is important to verify if this method is based on the best principles as regards the colouring matter of it. Science condemns it.

8th A silver medal for a table of the chemical proportions of organic colouring matters. This table ought to give, with the chemical proportions of the colouring principles, those of colouring matters of commerce, and for those which are soluble, the equivalent of decoctions at a given strength, say 10 or 20 Beaumé.

9th. A silver medal for a paper on the natural organic mordants of wool, silk, cotton, &c. By organic mordant is meant the substance which, after dyeing, retains in the unbleached wool, silk, or cottou, the colouring matters requiring mordants.

10th. A gold medal for a method of preparing uric acid otherwise than by the secretions of animals.

11th. A gold medal for a process for rendering the rids of murexyde affected by sulphurous emanations.

12th. A bronze medal for a paper on the manufacture of extracts of dye woods.

13th. Silver medal for any important improvement in the engraving of printing cylinders.

14th. A silver medal for the best forms and constructions of vats for dyeing and scouring.

15th. A silver medal for the production of an ultramarine colour which, having been thickened by albumen, and fused by steam in the ordinary manner, will not become deteriorated in any way.

16th. Silver medal for a paper on the theory of cotton unfit for colours, and known by the designation of "dead cotton."

THE SMITHFIELD CLUB CATTLE AND IMPLEMENT SHOW.

It again devolves upon us to lay before our readers a notice of *some* of the many useful articles comprised in the implement department of this now truly national annual exhibition. Although we remark an absence this year of any very striking novelties in agricultural and farm yard appliances, still we must admit that the show is a fair average one, and if devoid of great novelty, it is equally wanting in some of those absurdities which usually accompany an inroad of new-fangled notions.

Dray & Co.'s (Hussey's,) reaping machine still seems to attract its fair share of attention, and judging from the list of prizes which have been awarded to it by about thirteen different home and foreign agricultural societies, we may pretty safely put it down as a "champion reaper."

Mr. Wm. Smith, of Kettering, Northamptonshire, exhibits a light and useful looking horse hoe, provided with self-acting apparatus, whereby the hoes are permitted to rise and fall according to the nature of the ground, whether level or otherwise. By this adaptation, the implement will hoe hill-sides or the slopes of ridge and furrow with the greatest ease.

Mr. W. Sawney, of Beverley, exhibits his winnowing and blowing machines which have taken as many as 100 prizes. The chief points of value about them are a longitudinal vibrating screw worked by a crank motion without any noise and jarring, and an adjustable blowing board which enables the area of the blast to be regulated according to the quality of the tailings to be produced.

At this stand we also noticed one of Mr. Patterson's patent grinding and crushing mills, the excellence of which have been fully pointed out already in our pages.

We were much pleased with a well-made 3 horse-power fixture engine, by Barrett, Ewall, and Andrews, for its compactness and the facility with which all the working parts can be got at by the engineer. We strongly recommend it. This engine took the first prize of £20 at the Chester meeting.

We noticed some good substantial wrought iron lifting and screw jacks, which will be useful on any farm, exhibited by the maker, Mr. Eaton, of the Twywell Works, near Thrapston.

Smith Brothers, of the Nene-Side Ironworks, Thrapston, exhibit one of their improved haymakers with successive action forks; the forks being set in prongs on two round light revolving drums, and placed in a spiral direction so that they come into action successively; and by causing a more perfect throwing and scattering of the hay, admit of the machine being worked much more slowly than the ordinary kind.

Ransome & Sims again exhibit their ingenious self-cleaning rotatory barley and wheat screen which was shown last year.

We also noticed several of Boby's dressing machines and corn screens, the latter having competed successfully with Ransome & Sims' screen above referred to.

Mr. Isaac James, of the Tivoli Waggon Works. Cheltenham, exhibits his new patent washing, wringing, and mangling machine, which is of the simplest construction, and combines the greatest effects in the smallest space of any machine that we know of. The washing is effected by a vibratory tub, the clothes being simply shaken to and fro in the water, which is violently agitated by the motion of the tub. By the side of the tub is a convenient wringing box which discharges the water from the clothes back into the tub, by the pressure of a plunger. Above the tub are two rollers, which may be used either for wringing heavy articles such as bed linen, or for mangling purposes. Mr. James also exhibits a good liquid manure distributor or water cart which has taken nine prizes. It is provided with a double strainer so as to preclude the possibility of its becoming choked up, and is fitted with an internal division board in the tank which enables it to be used over hilly ground without producing any inconvenient displacement of the manure, and may be employed as an ordinary street water cart if desired.

Cornell's wrought iron tanks and corn bins are also well worth the attention of farmers and stock breeders, to whom we also recommend Mr. Cornell's portable boiler and steamer. This is a very useful and compact little apparatus. The furnace is carried on low running wheels, and contains a boiler over which is hinged, so as to turn on an axle, a large steamer, which is emptied at once by tipping it over on its hinge.

We were much pleased with some wrought-iron stable fittings exhibited by the St. Pancras Ironwork Co., amongst which we may mention a radial hay rack which prevents loss and waste of hay by the horse pulling it down from his rack. In this case the hay is confined between the horizontal gratings placed in the manger, and can only be drawn out bit by bit by the animal as it is feeding. We can also recommend an enclosed or sunk latch and handle for loose boxes and stable doors, whereby all dangerous projections which would be liable to inflict injury on a restive animal are avoided, the handle and latch being both flush with, or enclosed in the door.

E. R. & F. Turner, of Ipswich, are well represented by a goodly show of well made roller mills and crushers, for oats, linseed, malt, &c.

Wm. Tasker & Sons exhibit a capital moveable head plough, which enables the beam to be readily disconnected from the head at the headlands, and so admits of the plough being turned by resting on one of its handles, which is turned down for that purpose by the ploughman. This dispenses with the labour of carrying or lifting the plough round at each headland.

Wood's favourite reaper and mower, exhibited by Mr. W. M. Cranston, seems to give general satisfaction. It is a workmanlike, compact machine, and not too wide to pass a gateway, which is a great point in its favour.

Messrs. Burgess & Key and Mr. Samuelson show reapers provided with hinged or folding platforms, to overcome the objection of unwieldiness in these machines.

We noticed a good powerful chaff-cutter, exhibited by Mr. W. S. Snowdon, of Longford and King's Cross. The feed in this machine is suspended until the weight is off the straw, and the knife is from it, and consequently there is no liability to its choking or missing feed, whilst from the absence of cog wheels and worms it does not easily get out of repair.

We noticed a small model of a self acting horse rake, with a duplex action exhibited by the inventor, Mr. Wm. Gerrans, of Tregony, Cornwall. The great feature in this rake is its portability as an eleven foot rake, can be folded up so as to pass easily through a five foot gateway. The raising and cleaning of the teeth is effected either by a treadle pressed upon by the foot of the driver or by a handle. This will be found a useful implement on a farm.

Mr. J. Braggins, of Banbury, exhibits an excellent strap hinge, for hanging and regulating gates. The stem of the hinge is adjustable in its bracket, into which it is screwed, and is proposed to be placed at the top side of a gate, the bottom hinge being of the ordinary construction. By this hinge any farm labourer can adjust the hanging of the gate without the aid of any kind of tools, as by shortening or lengthening out the screwed stem from its nut, the gate can be raised or lowered as required. This is an example of the simple means which may often be applied for remedying defects which appear at the first glance insurmountable, or too troublesome to take in hand. What looks worse on a large farm, than having the gates all out of order, sunk in their hinges, and incapable of closing without making a deep rut in the ground, and consequently straining all their joints; yet how common is this, and how simple is the remedy, thanks to Mr. Braggins.

It is not often we come across a genuine *foreign* invention at the Smithfield Show, but in M. R. C. Ratel's scythe and saw setter, we have an excellent specimen. It consists of a small anvil and striker raised by a spring, so as to impart a sharp blow when struck by a hammer. The scythe to be set, in place of requiring to be ground or sent to a smith, is simply passed under the striker, which beats out its edge and makes it sharp and regular again. This useful little implement is manufactured at such a price as to bring it fully within the means of any farmer or gardener.

Mr. N. S. Dodge, of St. Paul's Churchyard, exhibits an American pump, requiring no packing or suction pipe. The working parts of the pump are immersed in the water to be elevated, and motion is imparted to them by rods connected to a vibrating hand lever at the surface, and to a T lever below, which actuates a double plunger, working in a pair of horizontal barrels. A pump of 3 inches diameter, and $3\frac{1}{2}$ inches stroke, is guaranteed to raise from 5 to 8 gallons per minute to a perpendicular height of 100 feet, worked easily by one man, whilst two men are said to be capable of raising the same quantity 250 feet. The construction of the pump is most simple and inexpensive, and is not liable to get out of order, there being no packing to attend to.

Mr. Joseph Seaman, of Worcester, whose admirable harrows we had occasion to refer to last winter, exhibits one of his patent lever ploughs with adjustable share and turn furrows. We understand this plough has given great satisfaction. It certainly appears sound both in principle and workmanship. At the same stand we noticed some of Wilson's elastic steel packing rings for pistons. For simplicity and efficiency, we know of nothing better.

Dinsmore's American air pressure churn appeared to attract a considerable share of attention. The principle of this churn is the introduction of compressed air into the churning vessel by means of a small bellows or air pump, before the agitation of the milk is commenced, so that when the agitation begins, the milk is to a considerable extent aerated, and this is said to produce a more perfect separation of the butter than can be effected in any other way. We can answer for this principle not obtaining with all the spectators, for we overheard a burly old farmer remarking that he could'nt see it all for they always had to let the air out of the churn after they began churning, so there are differences of opinion in making butter even.

Mr. Bentall is well represented, as he always is, by a large assortment of chaff cutters, root pulpers, seed crushers, and oil cake mills.

Lyne's patent field stile is exhibited by the inventor This stile consists of two moveable uprights pivoted on centres at their lower ends, and geared together at that part, so that the one cannot be moved aside without imparting a corresponding lateral motion to the other, thereby opening the stile. Suitable counterweights are employed for closing the stile, that is, for bringing the uprights into a vertical position again after they have been released. When open, these stiles will admit of a horse passing through easily, and as a contrivance for obviating the necessity for climbing, it is certainly ingenious enough.

Messrs. Blinkhorn, Shuttleworth, & Co., of Spalding, exhibit a beautifully finished, compact, and powerful little fire engine. The pump is double acting and placed horizontally. When worked the barrel is always full of water, the air is excluded, and the flow of water is therefore freer and more regular than from the ordinary perpendicular pump barrels.

Winter's weighing and lifting machine is a useful article. It is intended for weighing sacks of coal, corn, flour, or other heavy and bulky goods, and then elevating them sufficiently to enable a man to take the load easily on his back. A lad can raise by this simple contrivance a sack of from 12 to 20 stones weight, thus effecting a great saving of time and labour over the old systems, where a couple of strong men are required to lift a sack on to the back of a third man. The apparatus will be found generally useful in all trades, where heavy and bulky weights have to be carried about.

We must not omit to mention Mr. Thorley's stand, which is most elaborately "got up" as regards scenic effect. The decorations consist of several (noble?) cattle pieces! We can only say that if his "food" has the effect of bringing cattle into the condition and appearance depicted by him, it is a most wonderful discovery, *we* never saw anything on four legs like them! How is it that a horse after feeding on Thorley's food no longer resembles that noble animal, but turns a nondescript breed at once, that is, if we may judge from the illustrations we see in various parts of the metropolis?

Mr. Henry Grafton, C.E., of Chancery Lane, exhibits a model illustrating a system of steam cultivation invented by him. This appears to be a modification of Halkett's guideway system, but *without the guideways!* The engines lay their own rails on the surface of the land. The rails consist of endless broad bands (one for each engine,) of India-rubber, combined with fibrous materials; on to this flexible band is secured a series of wooden shoes, placed transversely thereon, on the underside. While bands are carried at each extremity of the framing of each engine by drums, which lay them down in either direction, according to the direction in which the engines are moving, so that the wheels may pass over them The tyres of the wheels are composed of air-tight tubes or cushions, filled with air or water, and encased in strong India-rubber fabric, so that the actual tread of the wheels will be a flat surface in place of an arc, the weight of the engine flattening the tyres on to the endless rails as they pass along. This is said to have the effect of closing up the openings or joints of the wooden shoes, and so producing a firm and ridged line of rail, which is further steadied by flanges on the driving wheels. The weight of the machine on the ra ls is also more effectually equalized and distributed by the use of these tyres. From engine to engine extends a platform composed of strong girders, of a length sufficient to cover, say 50 feet width of land. In this platform, as in the guide-way system, are attached the cultivating implements, so that a strip of land equal to 50 feet in width may be cultivated at one stretch. Suitable rails and travelling platforms are used for shifting the engines at the headlands. The idea certainly seems a feasible one, and if not too costly would no doubt pay well, as all steam cultivation in our opinion must, if properly managed and carried out; but whether the profit over horse cultivation on a given size of farm, of say 1000 acres, is to reach the enormous amount of £2261 14s., as estimated by Mr. Grafton, is very problematical indeed. Mr. Grafton even ventures to say, that as this great increase of profit, amounting to £2 5s. per acre, is alone due to the saving of animal expenses, a further profit of £3 per acre at the very least may be allowed for superiority of tillage by steam-power, making a total increased profit of £5 5s. per acre, or on the 1000 acres a clear annual gain over horse power of £5250!!

We must not omit to mention a capital brickmaking machine exhibited by the inventor, Mr. H. Clayton, of the Atlas Works, and said to be capable of turning out as many as 25,000 bricks per day.

Mr A. White, of Missenden, Bucks, exhibits a patent hay and corn lift, which is likely to be found a most useful article in the rickyard. It consists of a tripod easily moved, composed of long poles. A cradle of wood and iron rods is fitted loosely into the cart or waggon, into which the hay is loaded, and the whole is lifted bodily out.

We will now descend to the engine department, where we find a very good display, though, as we before observed, without any very striking feature of novelty. Perhaps some of those engines cannot be improved, and therefore why look for novelty.

Tuxford & Sons are well represented by one of their massive engines with the cylinders in the smoke box; a comfortable looking arrangement which we like very much. We wonder more is not done in agricultural engines towards keeping the cylinders warm, either by boxing them in, or even bagging them. We had occasion recently to inspect a steam plough at work on a very cold day, with a north-east wind blowing, and the rain pelting mercilessly on to the exposed cylinders of the engine at work in the middle of the field. It was enough to cause the cylinders for very spite to stop the engine at once, by turning into a surface condenser.

Smith Brothers exhibit a 3 horse-power portable engine, with cylindrical guides for the piston rods, the guide block being in fact a second piston working within a second cylinder, bolted to the cover of the main working cylinder. This arrangement effectually excludes dust and grist from the rubbing surfaces of the guide block, and is moreover easily fitted. The guiding piston is packed in a similar manner to the working piston, so that any wear in the guiding cylinder or piston is easily compensated.

Messrs. Clayton & Shuttleworth are, as a rule, well represented.

Also, Messrs. Turner, of Ipswich, who exhibit a well finished 3 horse power portable engine.

Hornsby & Sons exhibit a massive looking 12 horse-power portable engine with reversing gear, and

Mr. Thomas Aveling, of Rochester, shows his traction engine of 8 horse-power, and patent steerage apparatus. The hind axle of the engine is driven by an endless wrought-iron chain of a peculiar construction, which is not liable to stretch, so objectionable in the endless driving chains hitherto employed. The wheels on the driving axle are so fitted as to be capable of being coupled, or not, therewith as required. The steerage consists of a single sharp-edged swivel wheel, carried in the front ends of an ordinary pair of shafts, and worked by a long lever extending back to the front of the engine where the steersman is seated This is undoubtedly the most simple steering apparatus we know, and we should say it is no less effective, considering that the engine travelled up to the show from Rochester at the rate of about 4 miles per hour, and passed through Temple Bar in the busiest time of the day without the slightest hitch or mishap of any description. The London horses evidently don't much object to the introduction of steam on common roads, for, as Mr. Aveling informed us, his shafts were close up to an omnibus door, whilst a cab horse had his head right over his coal and water tank, so that there was sufficient proximity at all events to givē the horses a clear perception of a traction engine.

Haywood, of Derby, exhibits one of his neat looking 3 horse-power engines, and

Messrs. Chandler & Oliver are represented by a 10 horse-power ploughing engine, constructed on their patent principle, with the winding or hauling drums mounted, one on each side of the boiler, on the main axles.

There is a good show of combined thrashing machines, amongst which we noticed a small one by Tasker & Sons, and a substantially made larger one by Garrett & Sons, with cylindrical wire screen attached.

By this time we find we have made the entire tour of the implement department, and on turning round discover ourselves in the midst of the pigs and sheep. Our old friends the pigs still look very fat and uncomfortable, and seem to gasp for a little fresh air, but we notice a gradual reduction in the size, or rather fatness of the prize animals within the last two or three years, and are glad to perceive that *symmetry* and not *obesity* is now the chief aim.

CADMIUM AND ITS ALLOYS.

We extract from a recent number of the *Journal* of the Franklin Institute the following useful and noteworthy remarks on cadmium, communicated by Dr. Benjamin Wood.

The properties of cadmium appear to have been less clearly determined by chemists and metallurgists than those of most other metals. Discrepancies exist in regard to it, while some of its most remarkable, if not most useful properties are not at all noticed, at least by the generality of authors, even when explicit and elaborate as to similar properties possessed by other metals. Our ordinary works on chemistry treat of the metal very briefly, as of little importance—one of the latest says, it "has no practical value in the arts:"—but if duly investigated it will be found, we think, to possess qualities highly useful to the arts as well as interesting to science.

Melted under similar conditions with other metals, we find the metal requires for its fusion nearly the same heat as lead. It is somewhat later in melting but on the other hand it appears to congeal a little the sooner, (which may be due to a difference in the conducting power of the two metals.) We should, therefore, place its melting point in round numbers at 600° Fahrenheit, that of lead being placed by different authors, at 594°, 600°, and 612°. It volatilizes at a somewhat higher temperature, giving off orange-coloured suffocating fumes, which, when inhaled too freely leave a disagreeable, sweetish, styptic sensation upon the lips, and an intolerable and persistent brassy taste in the mouth and fauces, with constriction of the throat, heaviness in the head and nausea.

In the article on alloys of cadmium, in *Berthier's Traité des Essais*, it is stated in general terms that "most of the alloys of cadmium are brittle;" the individual alloys cited are particularly characterised as brittle, and no mention is made of others. The combination with mercury is thus described: "Cadmium unites with great facility with mercury, even when cold. The amalgam is of a silver white, and texture granular and crystaline. It can be obtained in octohedrons. It is hard and very fragile. Its density is greater than that of mercury. It fuses at 75° centigrade. It contains 0·217 of cadmium."

Combined in these proportions the compound will indeed be comparatively fragile; but one might be led to infer from this description that the metals combine in no other proportions. We have seen this particular form of amalgam cited by other authors when speaking of the combinations of cadmium with mercury but without any illusion to other compounds of these metals; although they unite with facility in other proportions, forming amalgams particularly noteworthy as contrasted with those of other metals.

While it has been assumed as a general rule, as above quoted, that the combinations of cadmium are not distinguished for fluidity, we have not found its fluidifying properties in respect to certain metals and alloys noticed in any work to which we have had access. Some of its alloys indeed are not remarkable for fusibility but, rather for the reverse; such are its alloys with silver, antimony, and mercury, their melting point being but little lower or even higher than that of the mean of their constituents. But others are much more fusible than the mean, as its alloys with lead, tin, copper, bismuth, zinc. In certain instances it manifests this property in so eminent a degree that it is singular it should not, if known, have been explicitly stated in all professed descriptions of the metal. Bismuth holds a high rank among metals for its property of promoting fusibility in alloys, as is particularly remarked in all chemical text-books, and wherever the metal is treated of, its alloys with lead and tin being specially noted as extraordinary instances. But in some combinations cadmium displays this property more decidedly than even bismuth. The alloy composed of from one to two parts of cadmium, two parts of lead, and four parts of tin is more fusible than the corresponding alloy af two parts (or less) of bismuth, two of lead and four of tin In smaller proportions its superiority is still more marked, requiring much less to produce the same effect, while it does not impair the tenacity and malleability of the alloy but confers hardness and general strength.

As to the brittleness which cadmium is said to communicate when combined with any other metals, the facts are, some of its alloys even with malleable metals are "brittle." But others are highly tenacious and malleable. Its alloys with gold, platinum, and copper, afford instances of the former. Its combinations with lead, tin, and to a certain extent with silver and mercury, are examples of the latter. An alloy of two parts silver and one of cadmium is perfectly malleable and very hard and strong; with equal parts of each it is also malleable but possesses less tenacity; but when mixed in the proportions of two parts of cadmium and one part of silver, it is brittle. Equal parts of cadmium and mercury form a tough and highly malleable composition; in the proportions of two parts of the latter to one of the former; the amalgam is nearly equal in malleability but possesses less strength. These mixtures are remarkable in view of the fact that most amalgams are exceedingly frail and brittle. A mixture of two or three parts of tin with one part of mercury is so fragile as almost to drop to pieces in handling: the amalgams with lead, bismuth, &c., are similar.

The fusibility of the compounds of cadmium and mercury is nearly that of the mean of their constituents, as indeed, appears to be the case with other amalgams. We do not perceive that mercury acts as a fluidifying agent in alloys—it does not strictly promote fusibility but serves merely to communicate of its own fluidity to the compounds in nearly the ratio in which it is employed; it does not, like cadmium, bismuth, &c., confer any new property in this respect. Being fluid at 39° below the zero of Fahrenheit's scale it will of course if it only retain its own property, reduce the melting point of the compounds into which it enters as an ingredient, below that of the metals with which it is united.

Most of the mixtures of mercury with other metals, although it may form certain definite compounds with them, indicate combination by simple solution and mechanical admixture rather than by chemical affinity. With cadmium, however, it exhibits a marked affinity, forming amalgams, or as they might be appropriately designated, alloys which possess distinctive characters, indicating a true chemical combination.

The following alloys are given in the specification of an invention of an improved composition suitable for metallic cement for which Dr. Wood has recently obtained letters patent in America:—

Cadmium from one to two parts; lead two parts; tin four parts; the result as to fusibility and tenacity being nearly identical whether the cadmium be used in the larger or smaller ratio.

This alloy possesses great strength and tenacity, is perfectly malleable, and melts at a temperature somewhat under 300° Fahrenheit, being some 50° or 60° below the melting point of the most fusible mixture of lead and tin used for solder; and is not inferior in other qualities. And in the essentials of tenacity and malleability it is superior to any of the so-called "bismuth solders" which melt at as low a temperature. Its qualities render it likewise superior to any other alloy for casting and modeling purposes, in certain cases, as will be at once evident to those versed in the business.

For greater fusibility to suit particular cases, mercury may be added, although its tendency is, especially if used in large proportion, to impair the quality of tenacity, according as it improves that of fusibility. But it may be used in quantity at least equal to that of the cadmium without sensible detriment, while three or even four times that amount will not so destroy the useful qualities of the composition but that it may be used to advantage as a solder for certain cases, thereby lowering its melting point to nearly the temperature at which water boils.

The greatest fusibility is obtained when cadmium is used in the proportions of the formula above named, or in the ratio of one-fourth to one-eighth of the joint quantity of lead and tin. The cadmium, for economy, may be considerably reduced, say to one-tenth or one-twelfth of the other two metals, without materially diminishing this quality of the alloy for practical use.

Cadmium may be used upon the same principle to improve the ordinary tinner's solder also called "fine solders," consisting essentially of tin alloyed with lead in the proportion of about one part lead to two or three parts tin; being used in the ratio aforesaid in respect to the sum of these metals, thereby conferring greater fusibility than a like ratio of bismuth, without, like bismuth, impairing the qualities of tenacity and malleability.

The same holds in respect to the combinations of lead, tin, and bismuth, or "bismuth solders" in the more fusible forms of which, the use of cadmium, according to the same principle, will produce results not hitherto obtained, and of decided benefit.

In particular, those mixtures of lead, tin, and bismuth which melt at, or somewhat under, the temperature of boiling water, and which in consequence of this extreme fluidity are known by the common name of "fusible metal," may, by the means indicated, be greatly improved in this quality without detriment to other useful qualities—the use of cadmium in any form in these mixtures to an amount equal to one-fourth, or one-eighth of the amount of lead and tin in them producing about the greatest attainable fusibility; although to insure the best results in respect to other qualities, as tenacity and pliability, it is better to use a little more lead and less tin than stated in the usual formulas of "fusible metal." We generally use the following proportions where the greatest fusibility is required, to wit:—cadmium one to two parts, tin two parts, lead four parts, bismuth seven to eight parts; the alloy in these proportions melting at about 160° Fahrenheit, being some 40° or 50° below the melting point of the said "fusible metal" and not inferior in other qualities for the purpose of a metallic cement. Another alloy consists of cadmium 56 parts, tin 59 parts, lead 103½ parts, bismuth 212 parts, being combined according to the chemical equivalents of the ingredients, conceiving the union to be more intimate and perfect—although subsequent experiment has not demonstrated any practical advantage to result from such nice adjustment of proportions.

When the cadmium constitutes from one-tenth to one-twelfth of the joint amount of lead and tin, the melting point will be about 170° or 180° Fahrenheit, being low enough for general use in most cases.

These proportions may be somewhat varied without materially modifying the result. The proportions of cadmium and bismuth remaining the same, those of the lead and tin may be greatly varied in respect to each other, provided they jointly hold a similar ratio to the whole. Thus for greater softness the lead may be employed in a much greater excess over the tin than stated in the formula, and for greater hardness and rigidity, the tin may preponderate over the lead.

This alloy may be used as a cement for very fusible alloys, such as the "white metal" used for bells, the *cliché* of the French, and the so-called "fusible metal" above named; also for light wares of pewter, &c., and as a convenient temporary cement; also for light castings requiring a more fusible material than the bismuth alloys; not being liable to the objections appertaining to the amalgams resorted to in such cases.

Its melting point may be lowered by adding mercury, which, in quantity equal to one or two parts of the cadmium, is less objectionable than in alloys without cadmium.

For greater tenacity with a melting point similar to that of the "fusible metal" before mentioned, a larger proportion of lead should be used, so that this metal shall equal or somewhat exceed the quantity of bismuth.

The mode of compounding the ingredients possesses nothing peculiar; they may be melted all together and mixed by stirring, or melted separately and poured together. The patentee usually melts the cadmium and lead together in one vessel, and the tin, or tin and bismuth, in another, pouring them together when melted, and mixing thoroughly by pouring the whole a few times from vessel to vessel. Mercury when used is added to the melted alloy, mixing as before.

Nor is the manner of using the composition peculiar. The parts of the metals to be cemented are touched with a solution of chloride of zinc, and the solder applied as usual, and fused by the application of heat in any of the ordinary modes. In casting, when used for taking casts or moulds from other fusible metals, these should be brushed over with black lead, lamp black, India ink, or other pigment, to prevent adhesion. A solution of logwood or red sanders in alcohol is very convenient for the purpose.

REPORT OF COMMISSIONERS OF PATENTS FOR 1859.

The Commissioners of Patents appointed under the Patent Law Amendment Act, 1852, (15 and 16 Vict., c. 83,) in compliance with the terms of the third section of that Act, make the following report of their proceedings under and in pursuance of the same for the year 1859, in continuance of their report of proceedings for 1858.

The number of applications for provisional protection recorded within the year 1859 was 3,000; the number of patents passed thereon was 1,976; the number of specifications filed in pursuance thereof was 1,897; the number of applications lapsed or forfeited, the applicants having neglected to proceed for their patents within the six months of provisional protection, was 1,024.

The Act 16 Vict., c. 5, enacts that all letters patent, for inventions to be granted under the provisions of the Patent Law Amendment Act, 1852, shall be made subject to the condition that the same shall be void at the expiration of three years and seven years respectively from the date thereof, unless there be paid, before the expiration of the said three years and seven years respectively, the stamp duties in the schedule thereunto annexed, viz., £50 at the expiration of the third year, and £100 at the expiration of the seventh year. The patent is granted for fourteen years.

Two thousand patents bear date between the 1st October, 1852, and the 20th June, 1853, (being the first 2,000 passed under the provisions of the Patent Law Amendment Act 1852). The additional progressive stamp duty of £50 was paid, at the end of the third year, on 604 of that number, and 1,396 became void. The additional progressive stamp duty of £100 was paid at the end of the seventh year on 207 of the 604 patents remaining in force at the end of the third year, and 397 became void. Consequently nearly 70 per cent. of the 2,000 patents became void at the end of the third year, and nearly 90 per cent. became void at the end of the seventh year.

All the provisional, complete, and final specifications filed in the office upon the patents granted under the Act since 1852 have been printed and published in continuation, with lithographic outline copies of the drawings accompanying the same, according to the provisions of the Act 16 and 17 Vict., c. 115.

The provisional specifications filed in the office and lapsed and forfeited, have also been printed and published in continuation.

Abridgments relating to the following subjects of invention have been published:—

- Drain tiles and pipes.
- Manufacture of iron and steel.
- Manures.
- Sewing and embroidering.
- Preservation of food.
- Aids to locomotion.
- Steam culture.
- Marine propulsion.
- Watches, clocks, and timekeepers.
- Fire arms and other weapons.
- Ammunition and accoutrements.
- Paper, pasteboard, papier mache cards, paper hanging, &c.
- Typographic, lithographic, and plate printing.
- Bleaching, dyeing, and printing yarns and fabrics.
- Electricity and magnetism, their generation and application.
- Manufacture and application of India-rubber, gutta percha, air, fire, and water proofing.

Other series are in the press, and it is intended to publish at the rate of eight or ten series in each year, completing the work in five or six years.

The following report of the Commissioners of Patents on the subject of the building of a patent office, public library and museum, has been transmitted to her Majesty's Treasury.

To the Lords Commissioners of her Majesty's Treasury.—The Right Honourable Frederick Lord Chelmsford, Lord High Chancellor of Great Britain, The Right Honourable Sir John Romilly, Master of the Rolls, Sir Fitzroy Kelly, her Majesty's Attorney-General, and Sir Hugh M'Calmont Cairns, her Majesty's Solicitor-General, being four of the Commissioners of Patents for invention under the said Act, report as follows:

The 4th section of the said Act enacts, that "it shall be lawful for the Commissioners of her Majesty's Treasury to provide and appoint from time to time proper places or buildings for an office or offices for the purposes of the said Act."

In pursuance of the requisition of the Lords Commissioners of her Majesty's Treasury, dated in 1853, the Commissioners of her Majesty's Board of Works provided certain offices for the Commissioners of Patents, being the ground-floor rooms of the Masters' Offices in Southampton Buildings, Chancery Lane, theretofore occupied by Masters in Chancery, abolished under the Act 15 and 16 Vict., c. 80; and an annual rent of £490 is now paid out of the Fee Fund of the Patent Office to the Suitors' Fund of the Court of Chancery for the hire of the same.

This arrangement was not considered to be permanent; no lease has been granted, and as these offices are now required for the occupation of the registrars and other offices of the Court of Chancery, due notice has been given to the Commissioners of Patents, requiring them to give up possession as soon as other suitable offices can be procured.

These offices were in 1853 sufficient in number and accommodation for the ordinary business of the office.

In the year 1855 the Commissioners of Patents established a free public library within their office, containing works of science in all languages, the publications of the Commissioners, and the works upon patented and other inventions published in the British colonies and in foreign countries.

This library has greatly increased and continues to increase, partly by purchases, but in a great measure by gifts and loans of valuable and useful books. It was resorted to at the first opening by inventors, engineers, and mechanics, as well as by barristers, solicitors, and agents engaged in patent business; it has become a collection of great interest and importance, and the number of readers has gradually so much increased that at this time convenient standing room cannot be found in the two small rooms within the office which can be appropriated to the library. It is the only library within the United Kingdom in which the public have access not only to the records of the patents and inventions of this country, but also to official and other documents relating to inventions in foreign countries, and this without payment of any fee.

A largely increased accommodation is urgently required.

No suitable building can be found in the immediate neighbourhood of Southampton Buildings, either to be rented or for purchase.

The new offices to be provided must be fire proof, for the preservation of the original specifications and other records of the office; the offices now occupied are fire-proof throughout.

The Commissioners of Patents are in possession of a collection of very valuable and interesting models of patented machines and implements, as also of portraits of inventors, many of them gifts, and others lent by the owners for exhibition. They are now exhibited daily, and gratuitously, in a portion of the Museum at Kensington assigned to the Commissioners of Patents for that purpose by the Lords of the Committee of Privy Council for Trade.

A museum of this nature necessarily increases, and the number of models now exhibited may be considered as forming only the foundation of a great national museum.

The great work of printing the old specifications of patents, with the drawings attached thereto, enrolled in Chancery under the old law, dating from 1623 to 1852, and 12,977 in number, was commenced in September, 1853, and fully completed in July last (1858). All have been fully indexed in series and subjects, and the indexes printed and published. These prints of specifications form about 900 volumes (450 imperial octavo volumes of drawings, and the like number of imperial octavo volumes of letter press). The indexes form seven imperial octavo volumes.

The cost of these valuable works has necessarily been great, amounting to £92,000.

Notwithstanding this great outlay, the balance sheet of income and expenditure for the year 1857, prepared for the annual report of the Commissioners, and laid before Parliament, shows a surplus income from the commencement of the Act, 1st October, 1852, to the end of 1857, of £6,000.

The balance sheet of income and expenditure for the year 1858, will increase the total surplus to £12,000 or £13,000.

The work of printing the old specifications being completed, as above stated, the expenditure on that head ceases altogether, and consequently the surplus income of the year 1859, is estimated at £31,000; adding this sum to the available surplus of £12,000 as above stated, and allowing a margin of £3,000, £40,000 may be safely estimated as the sum available for building purposes at the end of the year 1859.

The balance sheet of income and expenditure for the year 1859, is estimated as follows:—

Receipts.			
Stamp duties,	£95,000	0	0
Sale of printed specifications,	1,600	0	0
	£96,600	0	0
Payments.			
Fees to the law officers,	£8,500	0	0
Do. their clerks,	800	0	0
Salaries of officers and clerks,	6,500	0	0
Compensations,	4,600	0	0
Current and incidental expenses,	6,500	0	0
Cost of stationary supplied to the patent office by her Majesty's stationery office,	700	0	0
Cost of purchase of books for library, and binding,	500	0	0
Rent of offices,	500	0	0
Letter-press printing, lithographer's bills for drawings, and estimated cost of paper supplied to the printer and lithographer by her Majesty's stationery office,	16,000	0	0
Expenses in respect of the Museum at South Kensington, and clerks' salaries for ditto,	2,500	0	0
Revenue stamp duties,	18,500	0	0
Balance or estimated surplus income of the year 1859,	31,000	0	0
	£96,600	0	0

The Act of 1853 (16 Vict., c. 5) converted all the fees imposed by the Act of 1852 into stamp duties, thereby passing the whole income of the office to the consolidated fund.

The expenditure of the office is estimated and voted annually by Parliament.

There is no appearance of diminution in the number of applications for patents, and they may be safely estimated to continue for future years at 3,000 in each year.

This number will produce £95,000 in stamp duties, and adding thereto £1,600 for the average annual proceeds of sales of printed specifications, the future annual gross income may be taken at £96,600. The gross income is, however, liable to a deduction of £18,500 on account of revenue stamp duties, leaving the real available future income of the Patent Office at £78,100 per annum, or thereabouts.

The Patent Law Amendment Act, 1852 (15 and 16 Vict., c. 83), imposed certain revenue stamp duties upon patents. These duties have hitherto produced £15,300 per annum, and that sum has been charged against the office in the annual balance sheet of income and expenditure.

These duties are estimated for future years to produce £18,500 or thereabouts.

The work of printing the old specifications being completed, as above stated, the yearly future cost of the current specifications, abstracts of specifications, journals, indexes, &c., in letter-press printing, lithographic printing, and paper, will not exceed £17,500 per annum, as contrasted with the average yearly expenditure on those three heads of £39,375 within the years 1856-7-8.

The Commissioners of patents are of opinion that it is not expedient to propose to Parliament a reduction of the scale of stamp duty fees imposed by the Act of 1852.

They are of opinion that the fees paid upon the passing of a patent are not too heavy; the large number of applications (3,000 in each year) accounting for the large amount of income. Any material reduction in the amount of fees would undoubtedly tend to increase the number of useless and speculative patents; in many instances taken merely for advertising purposes.

The fee stamp duties and the revenue stamp duties are as follows:—

	Fee Stamp Duties.	Revenue Stamp Duties.
Within the first six months from the petition for provisional protection to the filing of the specification,	£20 0 0	£5 0 0
On the patent at the expiration of the third year,	40 0 0	10 0 0
On the patent at the expiration of the seventh year,	80 0 0	20 0 0

(The patent is granted for fourteen years.)

There are 3,000 petitions for provisional protection presented in each year, or thereabouts. Of this number, 1,950 reach the patent, and 550 patents pay the £50 additional stamp duty required at the expiration of the third year; 1,450 patents, or nearly three-fourths of the whole, thereby becoming void. Probably not more than 100 of the surviving 550 will pay the £100 additional stamp duty, required at the end of the seventh year.

Considering the beneficial results of the additional payment of £50, in sifting useless patents, the Commissioners are of opinion that it is not expedient to reduce the amount, and so long as the surplus can be expended for the benefit of patentees, and that portion of the community which is principally interested in, and connected with, the practical application to public purposes of discoveries and improvements in science and art.

They are of opinion that the surplus income, calculated as before stated, to amount to £30,000 at the end of the current year, 1859; and to increase in each succeeding year at the rate of £20,000 per annum, may be beneficially applied in the purchase of ground in a central situation, and in the erection thereon of a sufficiently spacious fire-proof building, for the Patent Offices and public free library attached thereto; and that the surplus fund may also be beneficially applied in the purchase of ground, and the erection thereon of a permanent and spacious building for the Patent Office museum; sufficient ground being taken for the extension of the building, from time to time, as may be required.

This is the more necessary, inasmuch as models of the most interesting and valuable description lie scattered over the kingdom, in many instances constructed at a great expense, for legal and other purposes, for which the owners have no present use, and many of which occupy a space inconvenient to them. These models, or many of them, would, as the Commissioners confidently expect and believe, be presented or intrusted to them for exhibition in such museum, provided the public are allowed free access to it at all reasonable times.

The Patent Office is the place of constant, daily, and hourly resort of patentees, agents, and all others concerned in obtaining Patents, and in ascertaining what discoveries and improvements have already been made. It should be conveniently placed with reference to the courts of law, the Government offices, and the offices of the Attorney and Solicitor General.

With respect, however, to the proposed new museum, the Commissioners of Patents are of opinion that the same reasons for a central position do not exist, and that it might be placed upon any spot easily accessible to the inhabitants of the metropolis, and that the place in which the models are now exhibited would be an eligible position, sufficient ground being there purchased or assigned for the purpose. A large space will be required for the building in the first instance, and a larger extent must be provided for its future extension; and sufficient ground cannot be found in the centre of the town for a building of the extent required, unless at an enormous cost.

The Commissioners are anxious to establish a library in conjunction with the museum, showing the patents already granted by foreign Governments, and those which from time to time are so granted; and from the facilities afforded by foreign Governments, the Commissioners have every reason to believe that this may be accomplished without difficulty.

These are the two objects which the Commissioners of patents present to the consideration of the Lords Commissioners of her Majesty's Treasury, and for which they are desirous to obtain their sanction:—

1st. The erection of a museum for the preservation and exhibition of the models, as above mentioned.

2d. The erection of suitable offices.

For the accomplishment of the former object, an opportunity at present occurs, as the Lords of the Privy Council constituting the Committee of Trade are (as the Commissioners are informed) willing to allot to them a portion of the land recently purchased at South Kensington, sufficient in extent both for the purpose of the erection of the building now required, and to provide for the future extension of the museum.

The Commissioners of Patents, therefore, request that the Lords Commissioners of her Majesty's Treasury will be pleased to sanction the application of a sufficient portion of the surplus, now derived from the fees paid on patents, for the purpose of accomplishing the objects above mentioned, and that with this view their Lordships will be pleased to give the necessary directions to her Majesty's Board of Works, to obtain a proper site for the proposed new Patent Office and Library, to be selected with the approbation of the Commissioner of Patents, and with the sanction of the Lords Commissioners of her Majesty's Treasury; and also to prepare the necessary plans, elevations, and specifications for this purpose, also to be submitted to the Commissioners of Patents for their approval; and to make contracts for the building of the same when approved.

If their Lordships consent to these proposals, the Commissioners of Patents have to request that a sufficient sum for the purpose, so far as the same may be required for the year 1858-9, may be included in the estimate to be laid before Parliament in the present session for Patent Office expenses.

A report of the Commissioners of Patents on building the Patent Office, Library, and Museum to the above effect was first transmitted to her Majesty's Treasury in April, 1858, and it was immediately thereafter referred by the Treasury to her Majesty's Board of Works, with instructions to provide a convenient site for the proposed new offices and library, and to prepare plans and estimates to be laid before Parliament.

A site was found last year (1859) at the northern extremity of the gardens of Burlington House, and plans and estimates were prepared, being a portion of a design for the appropriation of the whole of Burlington House Gardens for various public buildings. This plan has, however, been abandoned, or suspended by the Government, and no other site has been found for the Patent Office Buildings.

It is intended to make the Patent Office Museum an historical and educational Institution for the benefit and instruction of the skilled workmen employed in the various factories of the kingdom, a class which largely contributes to the surplus fund of the Patent Office in fees paid upon patents granted for their valuable inventions. Exact models of machinery in subjects and series of subjects, showing the progressive steps of improvement in the machines for each branch of manufacture are to be exhibited; for example, it is intended to show in series of exact models each important invention and improvement in steam propellers, from the first engine that drove a boat of two tons burthen to the gigantic machinery of the present day, propelling the first-rate ship of war or of commerce. The original small experimental engine that drove the boat of two tons burthen above referred to, is now in the museum, and is numbered one in the series of models of propellers.

The Commissioners are in possession of a large number of valuable models, remaining in their cases, for the reason that room cannot be found for exhibition in the very small space assigned to them in the museum at Kensington; they are also, and for the same reason, obliged to postpone the acceptance of many valuable models offered as gifts by manufacturers and inventors.

The public library at the Patent Office is in the same condition; the books daily increase in number, and many remain in cases, for the reason that shelf room cannot be found, much less room for the readers.

The surplus of the fee fund applicable to building purposes amounted at the end of 1859, to £46,000 (vide balance sheet); it will, undoubtedly, amount to £70,000 at the end of the current year 1860.

RULES AND REGULATIONS.—CLERKS AND OFFICERS.

No additional Rules or Regulations were made under the Act, within the year 1859.

The Commissioners of Patents by their report to the Lords Commissioners of her Majesty's Treasury of the 14th January 1859, recommended that a permanent establishment of clerks should be made in the specification division of the patent office, and that seven clerks, who had been employed for several years as extra clerks in that division, should be placed on the permanent establishment.

The Lords Commissioners of the Treasury agreed thereto, and by minute of the 4th March 1859, directed the following classification and salaries, to take effect from the 1st January, 1859:—

Specification Division.

Chief Clerk,		£350
Senior Class.		
First Clerk, £280 per annum.,	rising at rate of £15 per annum, to	320
Second Clerk, do.	do.	320
Third Clerk, £220 do.	do.	320
Junior Class.		
First Clerk, £150 per annum,	rising at rate of £15 per annum, to	200
Second Clerk, £120 do.	do.	200
Third Clerk, £120 do.	do.	200
Fourth Clerk, £120 do.	do.	200
Fifth Clerk, £120 do.	do.	200
Sixth Clerk, £120 do.	do.	200

The establishment of clerks in the patent division was regulated in like manner by Treasury minute of the 27th March, 1857.

An account of the salaries paid to the clerks and officers appointed under the Act for the year 1859:—

Clerk of the Commissioners,	£600	0	0
Chief Clerk in the Patent Division of the Office,	490	0	0
First Clerk,	295	0	0
Second Clerk,	295	0	0
Third Clerk,	200	0	0
Fourth Clerk,	150	0	0
Fifth Clerk,	130	0	0
The Superintendent of Specifications,	1,000	0	0
Chief Clerk in the Specification Division of the Office,	350	0	0
First Clerk,	280	0	0
Second Clerk,	280	0	0
Third Clerk,	220	0	0
Fourth Clerk,	150	0	0
Fifth Clerk,	120	0	0
Sixth Clerk,	120	0	0
Seventh Clerk,	120	0	0
Eighth Clerk,	120	0	0
Ninth Clerk,	120	0	0
Salaries of occasional and extra clerks, porters, and messengers,	522	10	0
	£5,562	10	0

FEES TO THE LAW OFFICERS.

No alteration was made within the year 1859, in the allowance of fees to be paid to the law officers and their clerks in cases of opposition to the grant of Letters Patent under the 47th section of the Act, or in the allowance of fees to be paid to them upon certificates of provisional protection under the 48th section of the Act.

Payments made to the Attorney and Solicitor-General for England, and their respective Clerks, for the year 1859, on account of fees upon patents for inventions, in pursuance of the Report of the Commissioners of Patents to the Lords of the Treasury, of the 1st May, 1853.

To Sir FitzRoy Kelly, her Majesty's Attorney-General, for certificates of allowance of protection on provisional specifications, 738 at two guineas each,	£1,549 16 0	
Ditto, for fiats on reference of complete specifications, 13 at two guineas each,	27 6 0	
Ditto, for signing warrants, 496 at one guinea each, from the first January to the 21st June, 1859,	520 16 0	
		£2,097 18 0
To the Clerk of the Attorney-General on provisional and complete specifications, 751 at five shillings each,		187 15 0
To Sir Hugh M'Calmont Cairns, her Majesty's Solicitor-General, for certificates of allowance of protection on provisional specifications, 747 at two guineas each,	1,568 14 0	
Ditto, for fiats on reference of complete specifications, 11 at two guineas each,	23 2 0	
Ditto, for signing warrants, 480 at one guinea each, from the 1st January to the 23d June, 1859,	504 0 0	
		2,095 16 0
To the Clerk of the Solicitor-General on provisional and complete specifications, 758 at five shillings each,		189 10 0
To Sir Richard Bethell, her Majesty's Attorney-General, for certificates of allowance of protection on provisional specifications, 743 at two guineas each,	1,560 6 0	
Ditto, for fiats on reference of complete specifications, 10 at two guineas each,	21 0 0	
Ditto, for signing warrants, 504 at one guinea each, from the 22d June to the 31st December, 1859,	529 4 0	
		2,110 10 0
Carry forward,		£6,681 9 0

Brought Forward,		£6,681 9 0
To the Clerk of the Attorney-General on provisional and complete specifications, 753 at five shillings each,		188 5 0
To Sir Henry Singer Keating, her Majesty's Solicitor-General, for certificates of allowance of protection on provisional specifications, 652 at two guineas each,	1,369 4 0	
Ditto, for fiats on reference of complete specifications, 11 at two guineas each,	23 2 0	
Ditto, for signing warrants, 488 at one guinea each, from the 24th June to the 14th December, 1859,	512 8 0	
		1,904 14 0
To the Clerk of the Solicitor-General on provisional and complete specifications, 663 at five shillings each,		165 15 0
To Sir William Atherton, her Majesty's Soliciter-General, for certificates of allowance of protection on provisional specifications, 76 at two guineas each,	159 12 0	
Ditto, for fiat on reference of complete specification, 1 at two guineas,	2 2 0	
Ditto, for signing warrants, 37 at one guinea each, from the 15th December to the 31st December, 1859,	38 17 0	
		200 11 0
To the Clerk of the Solicitor General on provisional and complete specifications, 77 at five shillings each,		19 5 0
		£9,159 19 0

CURRENT AND INCIDENTAL EXPENSES.

The 49th section of the Act empowers the Lords Commissioners of the Treasury to allow the necessary sums for providing offices under the Act, for the fees, salaries, and payments to be allowed, and for the current and incidental expenses of the office, to be paid out of such monies as may be provided by Parliament for the purpose.

An account of the current and incidental expenses in the office of the Commissioners, for the year 1859:—

Paid for two copies of *Gazettes* for the use of the office,	£12 12 0
Paid for translating titles of foreign specifications,	656 17 6
Paid for compiling index of journals, and copying titles of French patents, &c.,	130 17 6
Paid office keepers, carpenter's bill for packing cases for specifications, &c., sent to public offices in Edinburgh and Dublin, and work done in library, chimney sweep, &c.,	224 4 4
Paid for gas, postages, porterage, and sundries,	167 11 11
Paid for 2,020 tin boxes, to hold the impressions of the Great Seal attached to the patents, at one shilling each,	101 0 0
Paid the Sealer of the Court of Chancery for wax expended by him upon 2,020 impressions of the Great Seal,	151 10 0
Paid to the law stationers employed by the Commissioners for copying out of the office, at the rate of three halfpence per folio, and for writing clerks employed in copying in the office, and paid by time,	3,157 14 8

This charge stands in the place of the salaries of at least thirty copying clerks, which number of clerks must otherwise have been placed upon the establishment of the office in addition to the clerks permanently appointed.

The documents copied consisted principally of specifications of patents and provisional specifications for the printer, mostly of great length; copies of indexes for the printer; office copies of specifications, patents, and other records, made for persons applying for the same, the fees thereon being paid in stamp duties; office copies of patents sent to the public offices in Edinburgh and Dublin pursuant to the Act; three copies of each deed of assignment of a patent or licence of patent right recorded in the office pursuant to the Act, one copy for the record books of the office, the other two for the public offices in Edinburgh and Dublin, and two copies of the record book for the same offices in Edinburgh and Dublin. These assignments and licence deeds are, with few exceptions, of great length, and the fee of 5s. on recording each deed paid in a stamp duty; copies of notices for the *Gazette*, and various other records and documents.

Paid the lithographers employed by the Commissioners, for lithographic forms, &c.,	178 7 6

Consisting of forms of certificates of allowance of provisional protection, notices to proceed, notices of objections, forms for patents, for the warrants of the law officer, and for transcripts of patents, &c.

Paid Mr. Roger Smith for professional services in examining the premises occupied by the Great Seal Patent Office, and preparing a set of plans embodying a design for a new museum and patent office,	15 15 0
Paid messenger to the Lord Chancellor for obtaining the seals to patents during his Lordship's absence from town (vacation 1859),	53 11 3
Paid Mr Campbell for abridging specifications of patents relating to India rubber, waterproofing, gutta percha, &c.,	302 8 0
Carry forward,	£5,152 9 8
Brought Forward,	£5,152 9 8
Paid Mr. Casson for abridging specifications relating to clocks and watches,	77 14 0
Paid Mr. Woodcroft for his collection of books directed by the Lords Commissioners of her Majesty' Treasury to be purchased for the public library in the patent office	271 15 0
	£5,501 18 8

The Commissioners have thought it expedient to lay before Parliament, in the schedule to this report, an account of stamp duties in lieu of fees received under the provisions of the Act, with a balance sheet of their receipts and expenditure.

SCHEDULE.

An account of stamp duties, received under the Act to substitute stamp duties for fees (16 Vict., c. 5), for the year 1859.

3,000 petitions for grant of letters patent, at £5 each,	£15,000 0 0
2,193 notices of intention to proceed with application, at £5 each,	10,965 0 0
44 notices of objection to the grant of letters patent at £2 each,	88 0 0
1,979 warrants for patents, at £5 each,	9,895 0 0
1,976 patents sealed at £5 each,	9,880 0 0
1,897 final specifications filed at £5 each,	9,485 0 0
47 complete specifications filed at £5 each,	235 0 0
564 entries of assignments of patents and licenses, at 5s. each	141 0 0
430 searches and inspections, at 1s. each,	21 10 0
14,372 folios of office copies of documents, at 2d. per folio,	119 15 4
567 patents upon which the progressive stamp duty of £50 has been paid,	28,350 0 0
108 patents upon which the progressive stamp duty of £100 has been paid,	10,800 0 0
6 duplicate patents issued in lieu of original Patents lost or destroyed, £5 each,	30 0 0
20 petitions on application for disclaimers, £5 each,	100 0 0
6 caveats against disclaimers, at £2 each,	12 0 0
	£95,122 5 4

BALANCE SHEET OF INCOME AND EXPENDITURE FOR THE YEAR 1859.

Receipts.

In stamp duties in lieu of fees,	£95,122 5 4
By sale of prints of specifications, indexes, &c.,	1,682 3 1
Surplus income on balance of accounts from the 1st October 1852 to the end of the year 1858, (report to Parliament for 1858),	13,819 16 8
	£110,624 5 1

Payments.

Fees to the law officers of England,	£8,409 9 0
Their clerks,	750 10 0
Salaries of the officers and clerks in the patent office,	5,562 10 0
Compensations,	4,584 0 0
Current and incidental expenses in the patent office,	5,501 18 8
Cost of stationery supplied by her Majesty's stationery office, books for the free library, and binding, &c.,	1,285 0 5
Rent of offices,	490 0 0
Messrs. Eyre and Spottiswoode for printing specifications of patents, indexes, &c., and lithographers' bills for drawings accompanying specifications,	12,918 11 3
Cost of paper supplied to the printer and lithographer by her Majesty's stationery office,	2,857 16 4
Cost of coals and other fuel supplied to the patent office by her Majesty's office of works,	60 0 0
Expenses incurred in respect of the museum at South Kensington,	1,403 10 7
Salaries of officers and clerks for ditto,	575 0 0
* Revenue stamp duty account as below,	17,725 0 0
Surplus Income,	46,500 18 10
	£110,624 5 1

* The Act of 1852, in lieu of the old duties upon patents, imposed a revenue stamp duty of £5 upon the warrant of the law officer, £10 upon the certificate of payment of the progressive fee of £40 at the expiration of the third year, and £20 upon the certificate of payment of the fee of £80 at the expiration of the seventh year of the patent.

The Act of 1853 (16 Vict., c. 5) converted all the fees imposed by the Act of 1852 into stamp duties.

The *Revenue* stamp duty account for the year 1859 is as follows:—

1,979 warrants of the law officers for patents at £5 each,	£9,895 0 0
567 patents on which the progressive duty of £50 has been paid at the end of the third year from their respective dates (£10 being *Revenue* stamp duty, and £40 fee stamp duty); 567 at £10 each,	5,670 0 0
108 patents on which the progressive duty of £100 has been paid at the end of the seventh year from their respective dates (£20 being *Revenue* stamp duty, and £80 fee stamp duty); 108 at £20 each,	2,160 0 0
	£17,725 0 0

MARVELS OF THE BOGHEAD PARROT COAL.

At a recent dinner given by Mr. Meldrum of the Bathgate Paraffine Works, Mr. Weir, of Boghead, made the following remarks upon the beautiful substances which Mr. Young has produced and worked out in so splendid a manner:—Mr. Meldrum and his partner Mr. Young have extracted from the Boghead parrot coal, now designated the disputed mineral, an oil which in colour vies with the finest sherry or the purest amber, and in brilliancy is not much inferior to gas, and in my opinion is less offensive to the sight. In an economical point of view it has not its equal. It therefore, like the sun in its meridian splendour, is destined to illuminate the inhabitants of every nation upon earth. By his scientific skill, and by dint of the most indomitable perseverance, Mr Meldrum has also discovered in the same mineral a substance named paraffine, which is now employed as a substitute for wax in the manufacture of candles. In colour it vies with the most precious opal, and in purity with the newly-fallen snow. It emits a light more brilliant than that of wax, and is now used in the mansions of the nobility in London, and will, ere long, illumine the drawing-room of our Queen. In price it is cheaper than the finest wax lights. From the same unparalleled mineral, most astounding to announce, he has likewise extracted chloroform, and the purest spirits, both of which I have had the felicity of tasting.

This is a very proper tribute to the man who has accomplished such triumphant results in practical chemistry. Our readers will remember that we gave last month a full report of the very important trial—successful on Mr. Young's side—for the infringement of the patent under which paraffine and paraffine oil are now made at the Bathgate Works.

RECENT PATENTS.

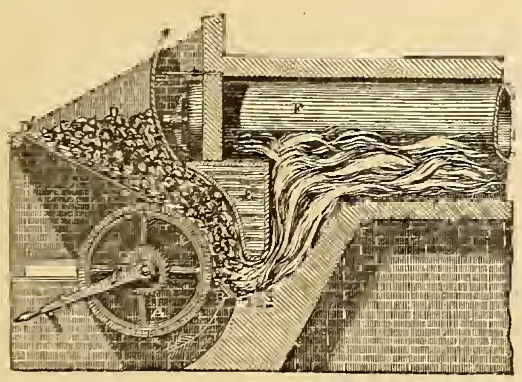
FURNACES.

J. H. Johnson, *London and Glasgow* (Jules Poirret, *Paris*).—*Patent dated February* 17, 1860.

The invention communicated to Mr. J. H. Johnson relates to a peculiar construction and arrangement of furnace, whether for stationary, locomotive, or marine boilers, or for other purposes, so as to obtain a perfect combination of the gases and the prevention of smoke effected. According to this invention, it is proposed to construct the furnace in such a manner, that the fuel will form one continuous mass from the front to the back end of the furnace, the continuity being maintained as the fuel burns away by mechanical means, as for example by vertically rotating fire grates carried on horizontal axes, by endless chains of fire bars placed at an inclination, or by ordinary fire bars at such an inclination that the fresh fuel will descend by its own gravity, and take up the place of the burnt fuel; a supply of fresh fuel being maintained from a feeding hopper above, or at the upper end of the grate.

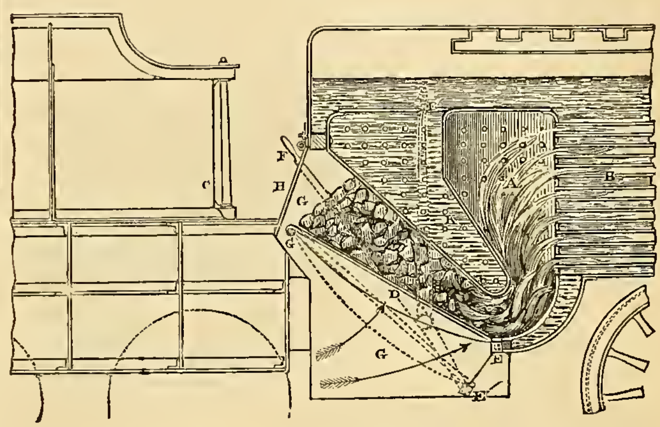
The subjoined engraving, fig. 1 represents a longitudinal vertical section of a stationary boiler furnace, constructed according to these improvements, as applied to a land boiler. Fig. 2 represents these im-

Fig. 1.



provements as applied to a locomotive boiler furnace. The fire place in fig. 1 is provided with a front circular moveable grate, A, and a lower grate, B, mounted on hinges and capable of being let down into a position for the purpose of facilitating the emptying of the furnace when desired. The grate, A, mounted on a central axis, is actuated by a lever handle, C, provided with a fall, which takes into the teeth of a ratchet wheel, keyed on to the axis of the grate; so that by moving the lever, C, a rotatory movement is given to the grate, A, and, consequently, causes the descent of the fuel contained in the hopper, D. The hinged grate, B, is connected with a system of jointed levers, provided with handles, convenient to the hand of the attendant. A tubular or hollow bridge, E, forms the back of the hopper, and front wall of the furnace, F; this bridge is kept constantly filled with water, whereby this part of the furnace is protected from the destructive action of the fire, whilst at the same time it serves to heat the water of the generator or boiler, G. The air entering the grates, A and B, as shown by the arrows, produce at this central point of the furnace, a continuous current or draught, which draws to and maintains at that part, all the gases developed by the heat, and assists their combustion in such a manner that they are entirely consumed by the time they arrive at the front of the boiler. The grate, A, with its cross shaft, is also capable of being moved forwards out of the way when the furnace has to be repaired or cleaned. The coal, or other combustible contained in the hopper is subjected to the feeding and steady subsidence produced by the occasional turning of the grate, A, may also be retained, and acted upon by a modified form of these grates. Thus, instead of the circular, a pair of endless chains may be passed round polygonal rollers or pulleys carried on two transverse shafts, one down

Fig. 2.



at the grate, B, and the other up at the mouth, D[1], of the hopper or hearth. These chains may carry the transverse furnace bars, forming an angular fuel-bearing surface, which would feed in the fuel by turning round the shafts or rollers, carrying the endless chains and furnace bars. In the locomotive boiler furnace, fig. 2, A, represents the fire box; B, a portion of the boiler; C, a part of the tender; D, is the bottom grate or fire bars, which lie at a considerable angle, and resting at their upper and back ends, on a fixed transverse round bar, G, while at their lower and front ends, they are supported by a moveable frame, E, which is carried by levers fast on a transverse shaft below the furnace and worked by a lever, F, fast on its outer end. By the movement of the lever, F, the grate bars, D, at their lower ends are thus made to vibrate along with their frame, E, so as to force the fuel beneath the water chamber or tube, K, within the body of the furnace, B. The furnace door for the admission of the fuel is at H, which with the back end of the boiler or water space, K, and side cheeks, G, frame, E, and furnace bars, D, constitutes the fuel chamber or hopper. The furnace proper is the space, A, in front of the water bridge, K, and this water space, K, is supplied by a pipe, opening into the side of the boiler or into the tender. In this system of furnace the incandescent fuel lying on its inclined surface, will always have a tendency to bear against the lower part of the water space, K, at the front of the furnace, where it is coked and forced into the furnace by the motion of the handle, F.

We may observe that these modifications are applicable also to furnaces of all kinds, as well as to those that are here described and illustrated.

MANUFACTURE OF THE NITRATES OF POTASH AND SODA.

William Henderson, *Glasgow*.—*Patent dated May* 1, 1860.

The patentee's improvements relate in the first place, to the manufacture or production of nitre from what are commercially known as "potashes," or from potash manufactured from any salt of potash and nitrate of soda, by dissolving together potash and nitrate of soda in their equivalent proportions, or in any other proportion, which may be convenient or necessary, and in separating the nitre from the spent or residual liquors left after the manufacture of soap. The ingredients may be treated separately, and afterwards boiled together in proper proportions The nitre is crystallised from the mixture or residual liquors, after boiling or slow evaporation, and the mother liquor is concentrated as often as necessary, and successive portions of nitre are crystallized until other salts are deposited by the evaporative process. The principal of these salts so deposited is carbonate of soda, and caustic soda. These are taken from the liquor by the ordinary process of boiling down, and the products are then removed from the pan or vessel as formed. Another portion of nitre is then crystallized from the mother liquor. This mother liquor, after the last production of nitre has been taken from it, contains a large portion of caustic soda, and this, with the previously removed carbonate and caustic soda, are applied according to the present invention, in the manufacture of hard soap, or to any other purpose for which soda and soda ash have been hitherto commercially used. The liquor or spent lyes from the soap pans are again evaporated, depositing (chloride of sodium) common salt, and this is done as often as necessary, to remove the rest of the nitrate of potash. The sulphate of potash, almost always present in the potashes of commerce, is also converted, according to the patentee's improvements into nitre. For this purpose, it is decomposed by means of the nitrate of lime, which results from the bleaching of palm oil with nitric acid. This decomposition of the sulphate of potash is effected at a convenient temperature above 212° Fahrenheit. The nitrate of lime is prepared by taking the acid which is washed from the oil and saturating it with lime, the resulting nitrate is then used in the manner before mentioned.

According to another modification of the improvements, the potash may be made caustic in the manner ordinarily pursued by soap makers, the resulting ley is afterwards made into soap by boiling it with fatty matter. The soap is then "cut up" or separated by the agency of nitrate of soda. The resulting soap is washed or cleansed as often as is convenient or necessary by boiling it with a solution of nitrate of soda. The liquor pumped from the soap pans now contains nitre, the liquor is again evaporated, salted, and crystallized, as often as is required for the removal of the whole of the nitre. In this way the production or manufacture of nitrate of potash, and of carbonate and caustic soda, may be effected in a very economical manner.

MACHINERY FOR DOUBLING YARNS.

George Mackenzie, *Paisley.—Patent dated June* 8, 1860.

Mr. Mackenzie's improvements in this class of machinery comprehend an improved system of driving the spindles and other appurtenances of twisting and doubling machinery, especially such machinery as is used in the manufacture of sewing thread. In carrying out the invention in actual practice all gearing and driving bands between the main horizontal driving shaft and the spindles are done away with, the actuation of the spindles being effected entirely by frictional contact.

Fig. 1 of the accompanying engravings is a transverse vertical sectional elevation of an ordinary doubling frame, leaving one modification of the patentee's improvements applied thereto. Fig. 2 is a front elevation of a portion of a doubling machine, which is specially arranged and constructed to suit the patentee's improvements. In fig. 1 the ordinary doubling frame is shown with the improved arrangement for driving the spindles. The framing, A, is of the ordinary kind, and consists of open end standards, connected by means of horizontal longitudinal rails; the bobbins, B, are arranged in triple tiers; the threads, C, from which are carried downwards, round the damping roller, D, passing twice round it, and thence over the small guide roller, E. From these serrated rollers the threads pass down through the porcelain eyes in the laterally projecting ledge or rail of the trough, F, to the flyers, G, which are carried on the spindles, H, in the usual way. Extending longitudinally on each side of the frame is a rail, I, which is supported by brackets bolted to the end standards of the framing, A. On the rail, I, are arranged, at equal and suitable distances apart, a series of vertical studs, J, which form the footsteps for the spindles, H, which pass up through the bushes in the rail, K. The thread, C, which passes from the eyes of the flyer, G, is wound on to the bobbin, L, the series of which is arranged on the vertically traversing rail, M, which receives its motion from a heart wheel fitted at the end of the framing in the ordinary way. The necessary drag or tension on the bobbins, L, is obtained by the pressure of the weighted cord, N, on the lower rims of the bobbins. The two rows of spindles are driven by means of two horizontal shafts, O, which are arranged one on each side of the machine beneath the spindles, and pass along in the curved recess which is formed in each of the vertical supporting studs, J. Each of the shafts, O, has at one extremity a pulley, round which is passed the endless crossed belt, P, by means of which the motion of one shaft is communicated to the opposite one. One of the shafts, O, has, at its extremity opposite the belt, P, a fast and loose pulley, which receives its motion from the engine or other prime mover, and which consequently gives motion to the whole of the spindles in the frame. Each of the shafts, O, has fixed to it, by means of pinching screws, a series of friction discs, Q, which gives motion to the pulley or wharve, R, on the contiguous spindle, H. The frictional driving discs, Q, may be formed of metal, wood, or other suitable material, and if found necessary, may be covered with leather or other material suitable for producing a powerful frictional contact with the wharves, R. These also may be formed of metal, wood, or other slightly yielding substance, such as gutta percha or vulcanite, the peripheries of the wharves being covered with leather or other equivalent material if necessary. In this way the ordinary central drum with its multiplicity of banding for driving the several spindles is done away with, the frictional mode of driving ensuring greater steadiness as well as considerably economising power. The patentee has in the drawings appended to his specification delineated several other modifications of the mode of driving the spindles by frictional contact, and so afford steady and powerful means of driving the spindles at a high velocity and with a comparatively small expenditure of power. The modification delineated in fig. 2 represents a portion of a doubling frame constructed according to the patentee's improvements, and occupying much less space than the ordinary frame, as well as being attended with other advantages. The framing, A, consists of open end standards

Fig. 1.

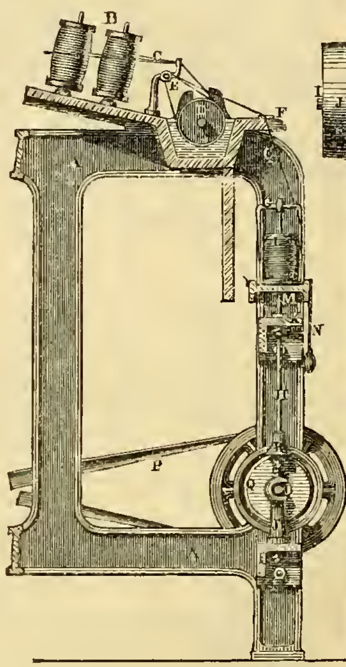
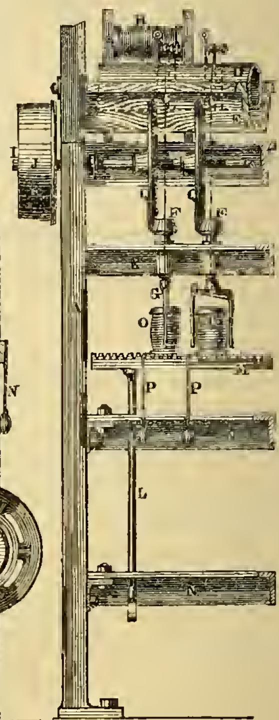


Fig. 2



which are made narrower than those of the ordinary kind, and are connected by the usual longitudinal rails. The bobbins, B, are arranged in tiers on an A-shaped frame, and the width of the machine may be still more contracted by making this bobbin frame at a more acute angle than the example. The threads or yarns, C, to be doubled or twisted are carried through the contiguous guide eye, round the roller, B, and down through the eye in the ledge of the trough, E. From this part the thread or yarn passes down through the hollow spindle of the wharve, F, which part of the machine is arranged so as to dispense with the ordinary spindles, H, as shown in figs. 1 and 2. The wharve, F, is fitted on the upper end of a tubular spindle; this spindle rotates in a deep tubular bush fitted in the stationary rail, K, extending between the end standards of the machine. The lower end of the wharve spindle is screwed to admit of the attachment of the flyer, G, thereto, which consequently rotates with the wharve. Parallel with the rail, K, and arranged a short distance above it is a shaft, I, which is driven from the engine, and drives by means of the pulley, J, and a crossed belt, the shaft on the opposite side of the machine, or *vice versa*, as described in reference to fig. 1. On this shaft are fitted the bevelled friction discs, Q, which give motion to the wharves, F; these discs are arranged on the shaft, I, in a manner similar to the modification before described. The discs are formed with an obtuse angled bevel, so that the upward tendency which the flyer and wharve have in rotating serves to increase the frictional hold of the wharve against the disc. And this may be further provided for by arranging a spring on the bush or rail, below the wharve, to press it upwardly as well as laterally against the disc. This arrangement of a spring acting on the wharve may also be advantageously applied to the modification shown in fig. 1, so as to keep the wharves uniformly in contact with their driving discs. At each end of the machine is arranged a vertical rod, L, to which the copping rail, M, is attached; the rods, L, pass through the rails, N, by which they are held in the vertical position. The lower end of each rod is attached to levers, which are actuated by means of a heart wheel to give the required rise and fall to the copping rail. The bobbins, O, are arranged on pins projecting up from the rail, M; these pins are placed equidistantly apart so that the bobbin stands fairly and evenly between the fork of the flyer and the necessary drag, or tension is exerted on the bobbin by the cord and counterweight, P. In this way the winding of the thread or yarn on to the bobbin is effected without the use of the ordinary spindles, by which there is a saving in the first cost of the machine. Machines arranged and constructed on this principle require less power to drive, occupy considerably less space, and from the uniform certainty of their action an attendant is enabled to attend to a greater number of sides than in the ordinary kind of machines.

MOULDING PIPES AND OTHER ARTICLES.

John Kinniburgh, *Shotts.—Patent dated May* 31, 1860.

We have before had occasion to report Mr. Kinniburgh's improvements in moulding.* The present invention consists in the application or employment and use of cast or malleable iron moulds in the casting of metal pipes instead of the common moulds of sand or loam. According to these improvements, the pipe mould is preferred to be made in two longitudinal sectional halves, turned or smoothed or not in their interior. These halves when put together with their joint edges abutting from the complete circle necessary for producing the external figure of the pipe, the interior being coated with blackening or other suitable coating. The two halves are held together by means of metal rings of a somewhat larger diameter than that of the metal mould, wedges being inserted between the rings and the mould to bind the two halves together, and yet allow for the lateral expansion of the metal mould when the melted metal is poured in to produce the casting. Or instead of using these binding rings, clamps or screws may be used, or flanges may be formed at intervals upon the two halves of the mould, holes being made through such flanges for the insertion of wedges or pins at or near the parts where the junction edges come together. Any suitable core may be used in these moulds. They make fine smooth castings, and may be used for casting in continuously without any alteration or breaking up as in ordinary moulds. Under other modifications, the patentee arranges and constructs the cast or malleable iron moulds in one piece, or in a greater number of parts than two, for although he gives the preference to the mould being forward simply in two parts, yet he does not confine himself thereto. In forming the mould in one piece for casting pipes and other generally similar articles, he prefers the mould to be composed of cast-iron, with a longitudinal slit or opening throughout its length. The parallel edges of this opening are brought together by means of malleable iron rings fitted on the outside of the mould, and when the melted metal is poured into the mould, these rings admit of the lateral expansion of the mould. In lieu of this arrangement, the mould may be formed without the longitudinal opening, provided it be fitted with external rings of wrought iron to prevent the fracture of the cast-iron mould when the molten metal is poured in. The patentee gives the preference, however, to the system of forming the mould with the longitudinal opening, which more readily admits of the lateral expansion. In this manner, also, these metal moulds may be arranged in three or other number of pieces, according to the size or external contour of the pipe or other article to be cast. In commencing to cast articles with moulds constructed according to these improvements, the patentee prefers, when necessary, to heat the mould in any conveniant way, in order to prevent the too sudden chilling of the article to be cast. After the preliminary heating, the subsequent operation of casting is sufficient to keep the mould up to the requisite temperature. With attention to this point, castings produced from these moulds are much superior to those obtained from the ordinary sand or loam moulds, and the system is particularly applicable to the casting of axle bushes and a variety of other generally similar articles either in brass or iron.

APPARATUS FOR THE MANUFACTURE OF PAPER.

Enward Gardner, *Maidstone.—Patent dated March* 20, 1860.

The patentee's improvements relate to certain improved constructions of what is known as the "making cylinder" in a paper making machine, and consists, according to one modification to be used in the production of laid paper, in grooving or channelling the surface of the cylinder, such grooves or channels communicating with the interior of the cylinder by suitable passages or openings. Transverse ribs or grooves, at right angles to the grooving or channelling of the cylinder, are also provided at suitable intervals. Any suitable design or trade mark may be made on the surface of the cylinder during the cutting process. Inside this cylinder is fitted a vacuum box, connected by a pipe with any convenient exhausting apparatus. According to another modification to be used in the production of wove paper, it is proposed to apply a wire gauze covering to the surface of the cylinder, such surface being composed of a number of grooved strips of metal placed side by side, with slits or apertures at convenient distances, for establishing a communication with the vacuum box inside the cylinder. These grooved strips of metal serve as the foundation or support for the wire cloth, and the use of the backing wire is thereby dispensed with.

Fig. 1 of the subjoined engravings is a corresponding side view and partial longitudinal section of a portion of the cylinder, showing the internal vacuum box in elevation. Fig. 2 is a transverse section of the improved "making cylinder," with its vacuum box, as constructed for the manufacture of what is known as laid paper. A, represents a brass cylinder, on the surface of which are fitted, by screws or otherwise, a series of brass strips, B, so disposed round the surface of the cylinder as to leave slits or openings, *a*, between their contiguous edges, as shown in the engravings These edges are bevelled, in order to leave a space of sufficient width at the base to cover the rows of holes, *b*, made beneath them in the surface of the cylinder, and thus establish a communication between the interior and exterior of the cylinder. A series of fine par-

Fig. 1.

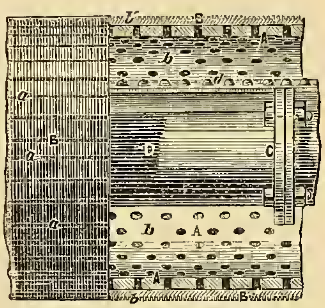
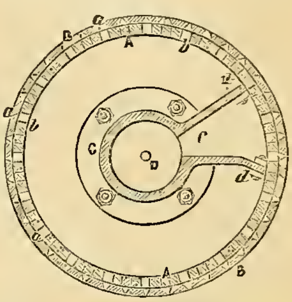


Fig. 2.



allel grooves or channels are cut across each of the strips, as shown more clearly at b^1, and over this grooved surface the pulp intended for the manufacture of "laid" paper is passed, a rotatory motion being imparted to the cylinder for the purpose of carrying the web of paper pulp along. The vacuum box, C, is contained inside the cylinder and remains stationary during the rotation of the cylinder. This box is formed on a tube, D, into the interior of which it opens by the long mouth or slotted aperture, *c;* the tube, D, is connected with an air pump or other suitable air exhauster, and the edges or lips of the vacuum box are provided with strips of leather or other suitable packing, *d*, for the purpose of establishing an air-tight junction between the edge of the vacuum box and the interior of the making cylinder. As the fine transverse grooves or channels made in the strips, B, communicate with the longitudinal slits or openings, *a*, and these latter are in direct communication through the holes, *b*, with the vacuum box it, follows that the vacuum will act freely and equally over the whole of that portion of the pulp contained on the cylinder immediately over the vacuum box, the straining of the water therefrom being effected as fast as fresh pulp passes over the vacuum box. It will be seen that by using a cylinder of this construction, the wire cloth covering is wholly dispensed with in the making of "laid" paper. In constructing a cylinder suitable for the production of "wove" paper, the transverse grooves in the surfaces of the strips, B, should be considerably wider, and a wire cloth covering is slipped over them. The spaces between the grooves serve as supports, for the wire cloth obviate the necessity for the ordinary "backing wires" hitherto employed.

ORNAMENTAL WEAVING.

William M'Ilwraith, *Glasgow.—Patent dated September* 20, 1859.

The improvements specified under these letters patent have reference to a novel system of, or arrangements for, weaving various classes of fabrics, but specially woven, roved or split harness figured muslins, by the agency of the "Jacquard," or "simple" apparatus. In either case the improvements are carried out in practice, by adopting a peculiar mode of tying or attaching the cords of the Jacquard apparatus, or the lashes of the simple, to the harnesses; each harness representing one split of warp, one or both threads of which split may be in the "mail."

Under one modification, the wires of the Jacquard apparatus or lashes of the simple, after passing through the ordinary perforated board, are tied or otherwise connected to the harness. A series of eight of the

* Vide *Practical Mechanic's Journal* for July, 1857.

cords are sufficient to explain the sequential order of tying the harness throughout the whole series, and to make the arrangement clear the cords as well as those which compose the harness, are supposed to be numbered consecutively. The cords are carried down through the perforations in the board, and each cord is furnished with a metallic eye or mail, the extremity terminating in weight, to keep the cord properly extended. The harness is connected to the Jacquard needles or the cords of the simple in the following order or sequence:—Number one needle or cord has tied to it the cords numbers one and two of the harness. Number two needle or cord is tied to number three cord only of the harness, whilst number three needle or cord is attached to numbers four and five of the harness. Number four needle or cord is connected to the single cord number six of the harness, and the next needle or cord, number five, has attached to it the cords number seven and eight of the harness. Number six needle or cord has the single cord nine tied to it, number seven having the harness cords ten and eleven attached to it; the series, as far as this, being completed by the needle or cord number eight being connected to the harness cord number twelve. In this way the whole of the harness is attached to the wires of the Jacquard apparatus, or to the cords of the simple, each alternate wire or cord being attached to two cords of the harness. Each cord of the harness represents one split of the warp, one or both threads of which split may be carried through the mails of the harness. Thus, by this system of tying or connecting the harness to the figuring apparatus, an ornamental design or figure which would require, by the ordinary mode of tying, nine hundred cords, is accomplished by this improved system with six hundred cords. In this way the patentee effects a considerable reduction in the cost of labour and expense in fitting up the apparatus, whilst the quality of the fabric produced is equal in all respects to that manufactured under the ordinary mode. Another and important advantage attending this improved system is, that the fineness of the outline of the figure is completely preserved, and the coarseness so much objected to in what is termed the two mailed system, is entirely obviated. Another modification of the improvements enables the weaver to dispense with one-third of the harness ordinarily required for what is termed split, or two thread harness. In this arrangement each alternate harness is caused to operate upon two splits of warp; this is done by carrying double the number of threads of warp through each alternate mail of the harness. By these means the weaver is enabled to effect a reduction of one-third of the quantity of harness usually required, and without any sacrifice of appearance in the fabric produced. In this manner figured or ornamental fabrics, but more particularly those known as "roved" or split harness figured muslins may, when woven by the more simple means before described, be produced at a considerable reduction in the absolute preliminary cost, as well as the labour involved therein.

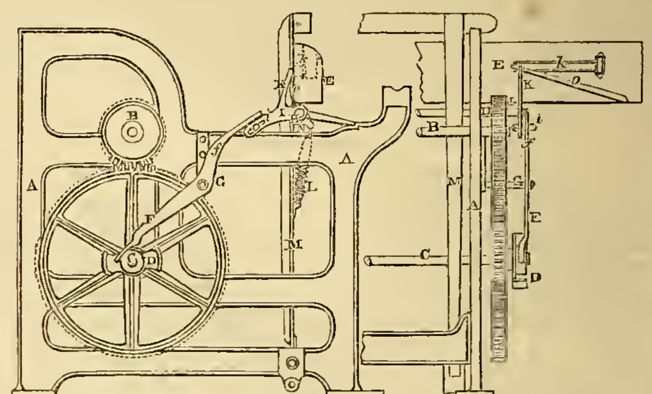
LOOMS.

James Mason, *Preston.—Patent dated April* 25, 1860.

The improvements specified under these letters patent consist in taking off the pressure of the springs from the stop rod fingers, which act upon the swell in the shuttle box of an ordinary frog or fast reed loom, at the time the shuttle is entering and leaving the box.

Fig. 1 represents an end elevation of part of an ordinary power-loom sufficient to illustrate the patentee's improvements therein; fig. 2 is a corresponding back elevation, one end only of the loom being shown. A, is the loom framing; B, the crank-shaft; and C, the tappet-shaft. To the outer end of the tappet-shaft is fitted a double cam or wiper, D, which at each back stroke of the lathe, E, elevates the tail of the lever, F, and depresses its short arm, *f*. This lever works on a fixed centre, G, secured to the loom framing. To the end of the ordinary stop-rod, H, is fitted a bent lever, I, the free end of which carries an adjustable anti-friction roller, *i*; on this lever also is formed one of the fingers, K, of the stop motion, the corresponding finger being fitted into the stop-rod in the usual manner; a helical spring, L, secured at one end to the slay sword, M, and at the other to a short arm, N, on the stop-rod, serves to keep the fingers, K, in contact with the swells, *k*, in the respective shuttle boxes, when not otherwise acted upon. A slight blade-spring, O (fig. 2), secured to the back of each shuttle box, and bearing slightly against the swell, serves to steady the shuttle when in its box, but does not exert sufficient pressure thereon to prevent it from freely entering and leaving the box. The action of this apparatus is as follows:—During the back stroke of the slay the anti-friction roller, *i*, on the end of the lever, I, is brought against and passes under the short arm, *f*, of the lever, F, which has been already depressed by the action of one or other of the two wipers, D. As the roller, *i*, moves under the arm, F, it gradually depresses the lower end of the bent lever, I, and consequently partially turns the stop rod, thereby removing the pressure of the fingers, K, from off the swell in the shuttle-box. At the return stroke or beat up of the slay, the wiper, D, allows the tail of the lever, F, to descend, as shown in fig. 1, thereby elevating the part, *f*, and allowing the fingers, K, to return again in contact with the swells, by the contraction of the helical springs, L, so as to cause the stoppage of the loom in the ordinary manner in case the shuttle should have failed to enter the shuttle-box. The lever, F, is cast with a double elbow, near to its larger end, as shown in fig. 2, and the tappet is made hollow for the purpose of allowing the loom to be reversed without raising the lever, F, so that the sudden stoppage of the loom by the stop rod, which sometimes causes the loom to reverse, will not bring the tappet in contact with the loom, but the lower end of the lever will pass under the wiper sufficiently far to enable the slay to return when the loom will be

Fig. 1. Fig. 2.



finally stopped. At one end of each wiper, on the underside, is formed a notch or projection, which comes in contact with the elbow of the lever, and so guides it on the top of the wiper. If this were not so the lever would pass under the wiper, as above described, when there is a rebound. By thus removing the pressure from the swell the shuttle requires much less power to drive it in and out of the box, and, as no impediment is offered to it, its boxing is rendered more certain. It is thus obvious that a loom fitted with this apparatus may be driven either much slower or much faster than when such apparatus is not applied, whilst the springs may be made much stronger and consequently ensure the stoppage of the loom, as their power need not be limited to what the shuttle can overcome.

TREATMENT OF SEWERAGE AND REFUSE MATTERS.

J. A. Manning, *London.—Patent dated May* 31, 1860.

Mr. Manning is an earnest and zealous worker in the vast field of utility which he has marked out for himself. His present invention has reference to the treatment of sewerage and the general refuse or waste matter of towns, whether of animal or vegetable origin, together with refuse coal ashes and cinders, when mixed therewith. Under these improvements, there is one general and effective system of treatment for the wet or sludgy deposits of sewerage matters; and another system of treatment for the dry refuse or waste of towns, including the sewerage deposits, after having gone through the desiccative process detailed in his former patents. This system is applicable to all towns, and a thoroughly concentrated manure may be secured for the permanent benefit of agriculture. By these improvements, great economy is obtained over the modes of treating sewerage matters. Whilst from the greater efficacy of the manure and its diminished bulk, a corresponding advantage ensues to agriculturists in its application to the land as well as great economy in its transit. In the present invention, the patentee uses alum sludge or its chemical equivalents as ascertained by analysis, that is to say, amongst other matters, its principal constituents of sulphate of alumina, sulphuric acid, and peroxide of iron, the chief agents for the deodorisation of the sewerage waters, and the precipitation, as well as the deodorisation of all the animal and vegetable organic matters held in suspension therein. He also uses the silicate of alumina, obtained from the refuse of bog cannel coal, after the gas has been extracted therefrom, which may be used either by itself, or converted into some other form of alumina to assist in the process of precipitating the animal and vegetable organic matters held in suspension in sewerage waters. And whenever it is desirable, waste animal charcoal is used, which is now occasionally employed by the patentee as a decolonizer of the supernatant water, as well as a fertilizing agent in the subsequent preparation of the manure. But instead of applying the before-named substances in the first tank or receivers of the sewerage from the common sewers, all matters capable of subsidence or deposit by their own specific gravity, such as road sand, street mud, and earthy matters in general, are allowed to settle down for a certain time, say one or two hours. The supernatant water is then drawn off or discharged into a tank or tanks at a lower level, to which is added one half of the quantity of alum sludge, or its chemical equivalent, which is found sufficient to ensure the precipitation of the finer and more valuable particles of matter still held in suspension in the water. Instead of drawing off the supernatant water into tanks at a lower level, it is preferred in some cases to sink in the channel which conveys the sewerage waters from the common sewer to the tanks, a series of pits or cess-pools, four or more feet deep, in which the road sand, street mud, and earthy matters, are deposited of their own specific gravity. By these means, a saving of 50 per cent. is effected in the employment of the alum sludge, for experience has proved that the less the sewerage is charged with earthy matters, not only is the deposit obtained infinitely more valuable for the uses of agriculture, but the smaller is the quantity of alum sludge necessary for the precipitation of the animal and vegetable organic matters held in suspension therein. With respect to the animal charcoal employed in this process, when necessary or desirable, a considerable change is effected in the mode of using it. The charcoal is made from the hoofs and horns of animals, and is a waste or refuse substance, arising from the manufacture of prussiate of potash. It contains a considerable amount of alkaline salts; amongst its other impurities which are of no use in the decolorization or the precipitation of any colouring matters in the sewerage waters. The charcoal is therefore lixiviated and afterwards dried in a furnace or oven, or by exposure to the atmospheric air, before applying it in conjunction with the alum sludge, as deodorisers and precipitants of the matters held in suspension in the sewerage and an additional clarifier of the supernatant water. If found useful or profitable, the water of lixiviation may be evaporated for the purpose of obtaining whatever salts may be dissolved therein for admixture or otherwise with the manufactured manure. The present invention or process is applicable to the treatment of the wastes of towns of almost every kind, whether of animal or vegetable origin, that is to say, to the contents of cess pools and privies, mixed or unmixed with coal cinders, ashes, &c, household wastes, stable manure, the refuse of flesh, fish, and vegetable markets, as well as those of slaughter houses, breweries, distilleries, tanneries, glue factories, cotton works, the refuse of dust binns, and all generally similar matters of animal and vegetable origin, including also the sewerage deposits after being treated by the process before-mentioned. In carrying these improvements into practical effect, the patentee prefers the following apparatus for effecting the destructive distillation of the refuse matters. A series of three or other suitable number of cylindrical vessels or retorts are arranged in a stack or "bench" in the brickwork. The retorts are formed of iron, and they are disposed in the brickwork at an angle, so as to admit of their contents being readily discharged from the lower ends. The lower extremity of each retort extends over a vertical opening or recess in the brickwork, which affords access to the end of the retort, and this part of the retort is enclosed by a semicircular end plate, to which is hinged a flap door, shutting in the other portion of the end of the retort. At the side of this recess in the brickwork, or at any other convenient part of the same, is arranged the furnace for dessicating the matters placed in the retorts. The furnace flue is carried round the retorts, so as to obtain the desired heating effect from the fuel, and a corresponding arrangement is common to all the retorts in the series. Branching away in a lateral direction from the upper part of the retort is a pipe for conveying away the gaseous products evolved from the refuse matters on applying heat thereto. This pipe is carried outwards in a horizontal direction, and is then bent downwards, so as to dip into a tank or reservoir containing water, which serves to absorb and condense the gaseous products. It is desirable to form this refrigerator as a closed vessel, so that when the water contained therein is saturated with the ammoniacal gaseous products, the other gases pass through an elbow pipe fitted to the upper part of the refrigerator, and are conveyed into a second refrigerating vessel arranged in convenient proximity to the first. He prefers also to arrange the retorts, so that their respective gas pipes or ducts may be readily carried into the refrigerator, to this end, the retorts may be conveniently arranged in a radial direction, the several gas ducts converging to a central refrigerator or refrigerators. The upper end of each retort is fitted with a hopper to convey the refuse materials into the retort; and extending across the open end of the retort is a sliding door or damper for preventing the escape of the gaseous matters. The sliding door is pushed to and fro by means of a laterally projecting handle, and the door when pushed home in its receiving groove, may be luted, if required, to prevent the escape of the gaseous matters. The interior of each retort is fitted with an agitator, so as to stir the mass of materials in the retort, and bring the whole in contact with the heated surface. The agitator consists of a central longitudinal shaft, supported in footstep and collar bearings in the retort, and furnished with radially projecting arms. Motion is given to the agitator by means of an ordinary winch handle fitted on the squared extremity of the shaft, as it is only necessary to stir the materials from time to time. But, where the manure works are of considerable magnitude, the agitators may be driven by steam power, the motion being imparted by spur gearing, which is put into and out of gear by means of a coupling as required. Or the agitators may be actuated at intervals by self-acting mechanical means. Upon the refuse matters being placed in the retorts, the fires are raised so as to bring the retorts up to a low red heat, or such a temperature as will destroy as far as possible the organic matters in the refuse, but not sufficient to decompose the salts contained therein, or cause vitrifaction of the silicates. By means of the agitator, the mass is broken up, and the undried portions are brought into contact with the heated surface, the gaseous products meanwhile pass off by the gas ducts to the refrigerators. The rotatory motion of the agitator in each retort, serves also to assist in pulverising the mass, so that when the cinders are separated from the dessicated materials, all the products which are of value as manure are in a finely divided state, and in the best and most effective form for application to the land. The cinders and other similar matters are readily separated from the manure by means of a sieve arranged in a sloping position and fitted below the lower extremity of each retort. So that when the contents of the retort are discharged, the dessicated manure falls through the sieve into the recess in the brickwork, and the cinders fall outside and serve to supply the furnaces for heating the retorts. Fæcal matters when obtained without admixture, may be treated by distilling them to dryness in large cast-iron stills, the ammoniacal vapours being conveyed into refrigerators as hereinbefore described. In some cases, the ashes obtained after the destructive distillation of the refuse matters, as well as the waste matters of towns not previously subjected to distillation, may be placed in large wooden, or other suitable covered receptacles for the purpose of subjecting them to the action of steam. This mode of treatment is for the purpose of dissolving out the alkaline or other soluble salts from the mass. The water of condensation or solution containing the soluble matters, is subsequently evaporated or otherwise treated for the purpose of obtaining the valuable salts therefrom. The ammonia which is evolved from the materials in the retorts is absorbed by the water in the refrigerator, and this ammoniacal liquor is converted by the ordinary chemical process into sulphate of ammonia. If, however, it is found that the gaseous products evolved from the refuse materials in the retorts contain a sufficient amount of hydrogen and carbon, these gases may be judiciously applied to the illuminating of the manure works or other generally similar purposes. In boiling or distilling ammoniacal liquor, in order to deprive it of its ammonia, it is usual to run off the liquor after the first boiling into a suitable vessel, and apply lime thereto, and re-distil it. The patentee shortens this process by adding the cream of lime to the ammoniacal liquor in the boiler or distilling vessel; after the distillation has proceeded to a certain extent, the solution of lime being pumped into the boiler by means of a force pump. The patentee thus obtains and draws over into the sulphuric acid tun all the ammoniacal products of the liquor at one instead of two operations. By these means, the refuse matters of towns are utilized to the utmost extent, and are again made subservient to the purposes of agriculture and commerce.

MANUFACTURE OF WATER TRAPS.

J. H. Johnson, *London and Gasgow* (J. A. Lowe, *New York, U. S.*)—*Patent dated December* 20, 1859.

These improvements relate to the manufacture of "water traps" or pipes, formed with **S** bends as used by the plumbers. According to the ordinary mode of making water traps, two bent pipes are soldered together and are consequently found to be very liable to break at the seam, by reason of the tin being eaten out of the solder by the action of acid, and also by reason of the straining of the traps from the settling of buildings, such traps being found to be generally thinest at the bends, where in reality the most strength is required. In constructing water traps according to this invention, these objections are completely obviated, as the entire trap or bend is cast in one piece; but as a difficulty would occur in withdrawing the core, it is proposed to employ a core of a peculiar construction, which constitutes one of the main features of the invention. This improved core is made of metal, and consists of segments of the bend put together separately upon a series of square blocks joined together by links, the segments fitting with dove-tails on the external surfaces of the blocks in such a manner that they will form a curved metal core of a round section, the end and lateral joints of the component parts being sufficiently close to ensure a smooth surface in the pipe or trap.

The subjoined engravings, fig. 1, represents a longitudinal section of the mould and core, to be used in casting **S** water traps; and fig. 2 is a transverse section of the peculiar core taken through the bend. This improved core consists of a number of blocks, A, of a square or other convenient transverse section, having dove-tailed grooves or projections formed on the sides thereof, with or into which grooves or projections are fitted the segments, B and C, which are turned so as to form a circle transversely, when put together in their places round the several blocks, A, and are also so shaped or curved longitudinally as to correspond to the required bend in the trap, as shown in fig. 1. Each block is connected to its neighbour by the links and pin joints, D, so as to form a flexible chain before the curved segments are fitted therein. In one-half of fig. 1 the segments are represented in their places in the mould fitted on to the internal blocks, A, as when in use, and the other half shows the segments with the internal blocks drawn out preparatory to the entire removal of the core after the casting is made. In completing the core of the mould a cylinder, E, is screwed on to each end of the bend of the core, the segments having portions of screw threads formed on them internally for that purpose, and on these cylinders are shrunk the ring, F, which fits into a shoulder turned on the segments, and presses them against the screw, which now holds them firmly. One of these cylinders, with the bend or segments screwed on, is now placed in the mould with long bearings, as shown, and is screwed up firmly, the other half of the core is drawn tightly against it, so as to close all the end or cross joints of the several segments; the dovetails, if properly fitted, holding the lateral or longitudinal joints tight. On pouring in the metal the core will be completely enveloped, and in order to withdraw the core the cylinders are first unscrewed and removed, and a pipe of thin sheet metal is introduced into the mould, and pressed against the ends of the segments so as to hold them back whilst the inner blocks are drawn out, which it is proposed to accomplish by the aid of a hook inserted into the mould, and connected to the link of the first or outer block. The sheet metal pipe is now removed, and the outer segments, B, of the bend are removed by a hook fitting a hole made in the interior thereof, after which the segments, C, are easily withdrawn, and the interior of the trap left perfect.

Fig. 1.

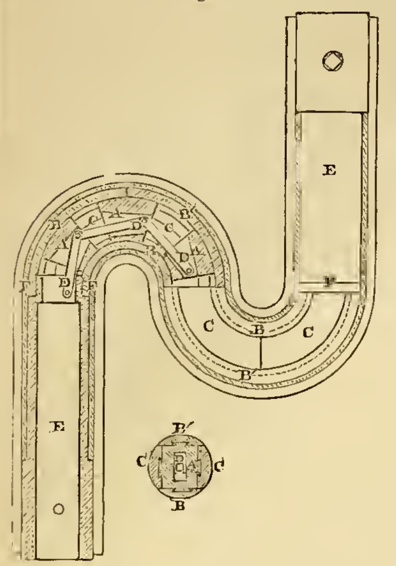


Fig. 2.

STEAM HAMMER FOR SMITHY AND GENERAL WORK.

By MR. R. MORRISON, *Ouseburn Engine Works, Newcastle upon-Tyne.*

(*Illustrated by Plate* 265.)

THE plate accompanying our present number represents a novel form of steam hammer, which is one of the modifications embodied in Mr. Robert Morrison's recent patent. Fig. 1, plate 265, is a side elevation of the steam hammer complete; fig. 2, is an elevation taken at right angles to fig. 1, and looking towards the back of the framing within which the gearing is arranged. To the sole plate, A, is bolted the hammer framing, B, which is arranged in the form of a wedge or A, shaped in its transverse section, the side portions of which, from the back of the sole plate, converge towards the anvil block, C. This block is arranged beneath the overhanging cylinder, D, which is cast in one with the framing, A, and forms the outer extremity of the projecting part. The top and bottom cylinder covers are bolted to flanges formed on the framing, B. The heavy hammer bar, E, which serves also as the piston-rod, works out through stuffing boxes formed in the end covers of the cylinder, D. To the lower end of the bar, E, is cottered the steel faced hammer, F, which descends on to the anvil, G, below, which is arranged on the block, C. In one of the inner angles of the framing is arranged the steam pipe, H, which enters the lower part of the slide valve chest, I. The flow of steam into the valve chest, I, may be regulated by means of a throttle valve, which is worked by the hand lever, J, on the upper end of the valve spindle, that is carried up so as to be within convenient reach of the attendant. The steam after actuating the piston which is forged on the bar, E, passes down the exhaust pipe, K, which is arranged parallel to the steam-pipe, H, but in the opposite corresponding angle of the framing. The slide valves are actuated in a self-acting manner by means of the hammer bar, E, which has a collar fitted on its upper extremity, this collar is made with a laterally projecting part that carries an anti-friction roller. This roller works up and down in the slotted link, L, the lower part of which forms a bell-crank lever, that is centred on a stud carried in a laterally projecting part of the cover of the cylinder, D. The free extremity of the link, L, is attached by means of the cross head, M, to the duplex spindles, O, of the slide valves. The arrangement of the improved valves which Mr. Morrison uses are fully described and delineated in the number of our *Journal* for October last, p. 178. The upward and downward motion of the hammer bar, E, causes the link, L, to operate the valve spindles in a reciprocatory vertical direction. There are two slide valves arranged within the chest, I, one of which admits the steam above the piston, and the other below it. By means of the handles, N, the valves may be raised or depressed; that is to say, the spindles are screwed at the central part and pass through nuts on the back of the slide. In this way, by turning the left hand spindle, its slide, which admits the steam below the piston, will be raised, and it may be screwed up so far that the hammer bar at the top of its stroke will not give the valve a sufficient downward motion to shut off the steam; the hammer, consequently, remains suspended. In like manner, the other valve may be screwed down so as not to open at all, or to open at any part of the stroke. At the back part of the framing, between the diverging sides, there is fitted a platform, on which the attendant stands to operate the throttle valve, or the slides, when this is required. When standing on the platform, the operator can clearly see the work going on below, at the same time he has the whole of the steam controlling movements immediately within his reach. Access is had to the platform by means of the light iron ladder shown in fig. 2. The arrangement of the hammer is in all respects well adapted for the purposes for which it has been designed.

LAW REPORTS OF PATENT CASES.

STEERING SHIPS: M'SWEENY *v.* DOUGLAS.—This was a motion in the Court of Common Pleas before Lord Chief Justice Erle, and Justices Williams, Byles, and Keating, for a new trial in the matter of an action tried at the last Durham assizes for the infringement of a patent steering barrel to be applied to the ropes used in guiding the rudders of ships for steering ships. The action was tried before Mr. Baron Wilde, and resulted in a verdict for the plaintiff, with 10s. as nominal damages. Counsel for defendant now moved for and obtained a rule *nisi* for a new trial.

FINISHING YARNS: ERMEN *v.* LIDDLE.—This was a motion made before Vice-Chancellor Sir W. P. Wood, for an injunction to restrain the defendants from violating a patent for an improved method of finishing yarns and threads. The invention consisted of the application of revolving circular brushes to threads and yarns in a state of tension, so as to impart to them smoothness and a lustre not previously attainable. The plaintiff had brought an action against one of the defendants for the infringement, and had recovered judgment, the judge certifying that the validity of the patent had come in question on the trial; reported in vol. iv., *Practical Mechanic's Journal*, page 185. Subsequently the defendants in the action had assigned the machines in the use of which the infringement consisted, and the assignee had left the machines to the other defendant, who had previously been in the first-mentioned defendant's employ. The first-mentioned defendant now acted as manager and superintendent at the works. In opposition to the motion, affidavits were read questioning the novelty of the invention.

Mr. Rolt, Mr. De Gex, and Mr. Webster supported the motion.

Mr. Giffard, and Mr. Joyce, for the defendants, contended that as to one of them, at all events, no title had been established at law, and that as to the other the trial had taken place under circumstances of surprise, which prevented him from adducing all the evidence which he otherwise might have brought forward. The utmost, therefore, that could be asked was liberty to proceed at law on proper terms.

The Vice-Chancellor said that after the expense to which the plaintiff had been put in the action, it was too much to ask that before he could obtain the only useful result of it, having regard to the assignment which had been made, he must incur all the expense over again. The injunction must be granted without any terms being imposed on the plaintiff.

EMBOSSING AND FINISHING WOVEN FABRICS: RALSTON *v.* SMITH.—This case was tried before Chief Justice Erle, and Justices Boyles and Keating, and was an action for the infringement of a patent for embossing and finishing woven fabrics.

The court were of opinion that there was no infringement, and gave judgment for the defendant.

COPYRIGHT: BOUCICAULT *v.* EGAN.—In this case before Vice-Chancellor Sir W. P. Wood, counsel moved on behalf of Mr. Dion Boucicault, the dramatic author and actor, for an injunction *ex parte* to restrain the defendant, the lesse of the Queen's Theatre, Manchester, from representing the third scene of the second act of a piece called the "Lost Bride of Garry Owen"; or "St. Patrick's Eve," announced for per-

STEAM HAMMER.

R. MORRISON,

OUSEBURN ENGINE WORKS,

NEWCASTLE-ON-TYNE.

Fig. 1.

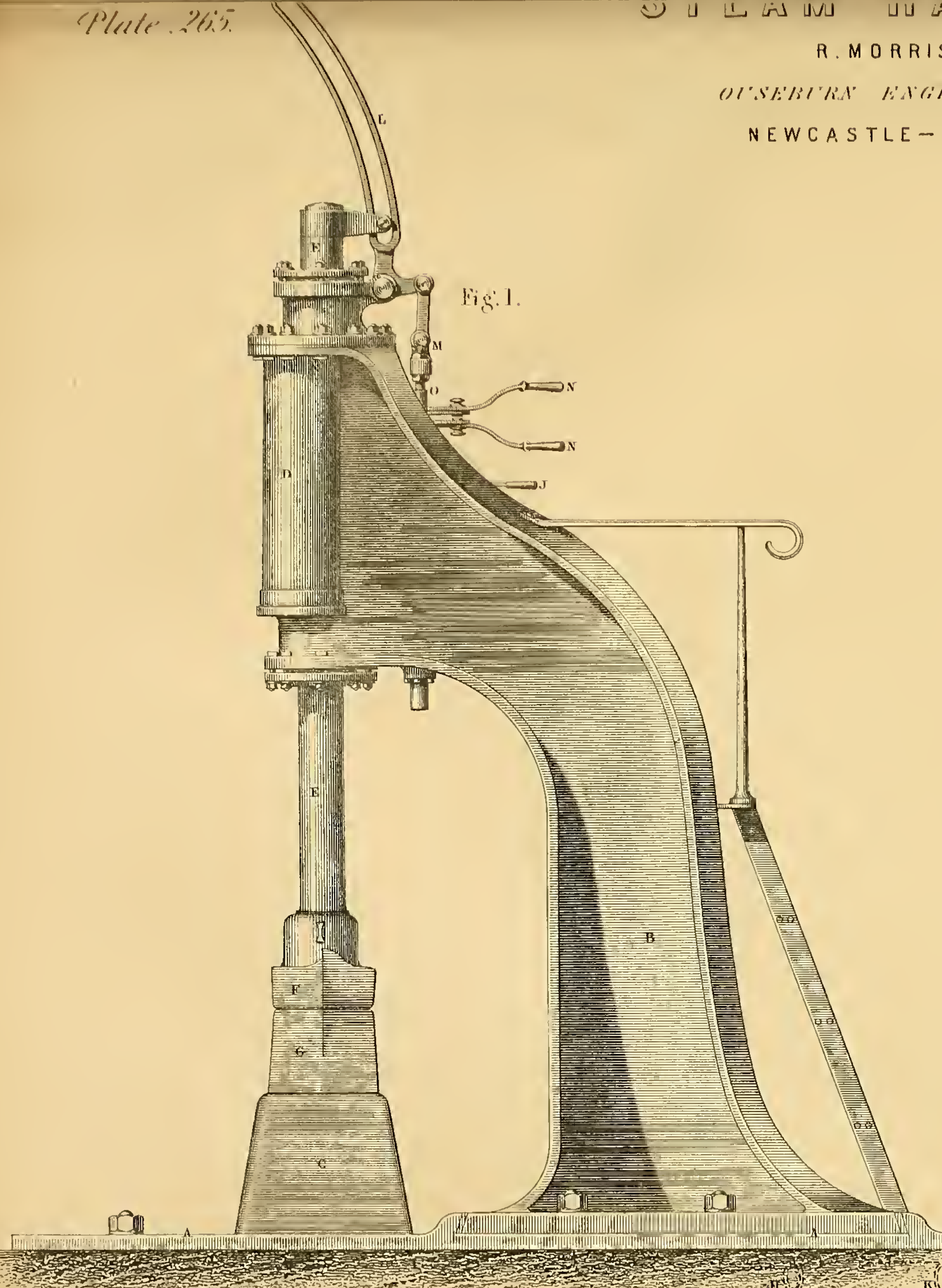
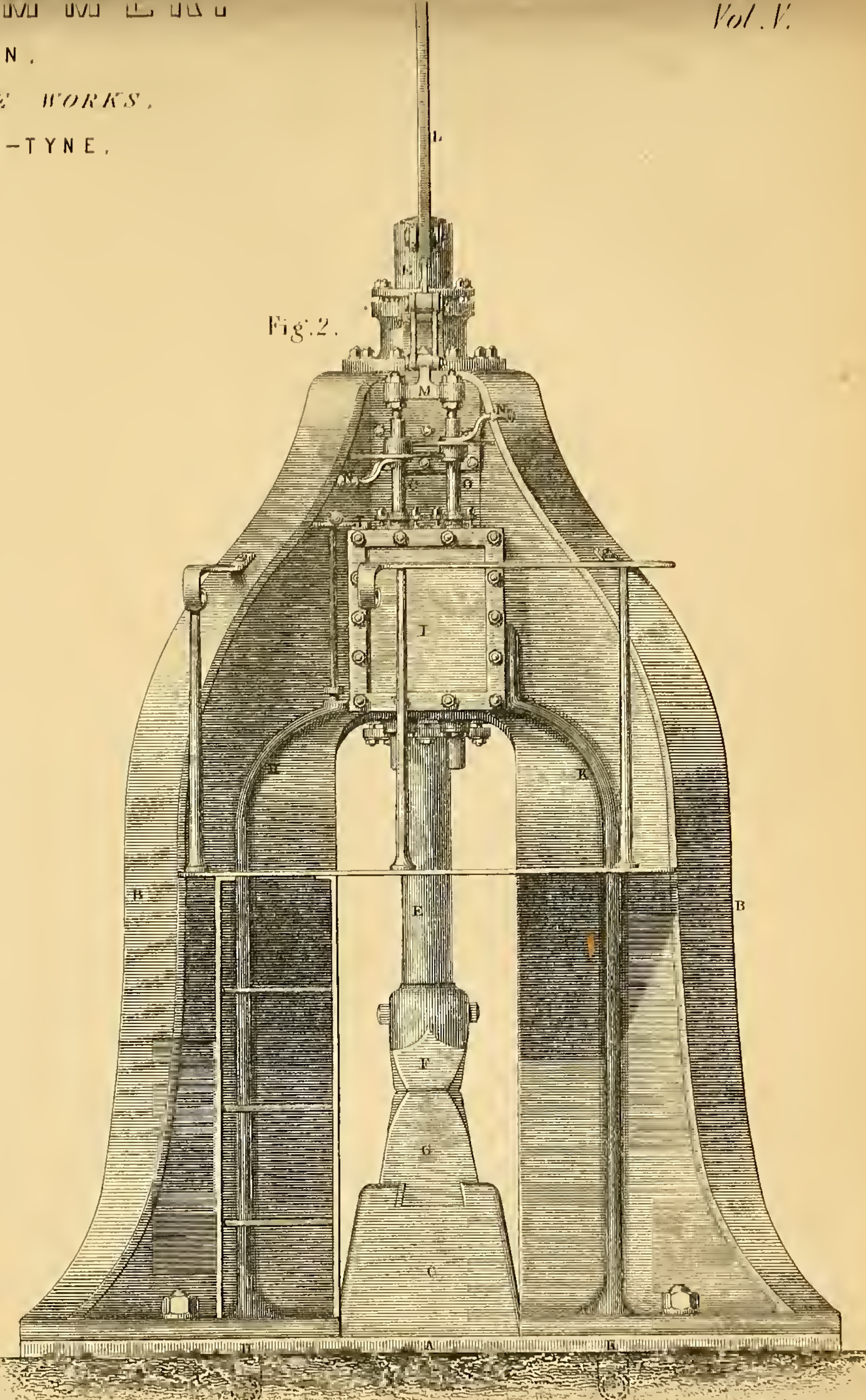


Fig. 2.



—SCALE.—

INS. 12 9 6 3 0 1 2 3 4 5 6 7 8 9 10 FEET.

W. Johnson Patent Offices, 47 Lincoln's Inn Fields & Glasgow.

Mackay & Kirkwood, Glasgow.

formance for the first time on Monday evening, on the ground that such scene was a merely colourable variation of the most important and effective scene in Mr. Boucicault's piece, the "Colleen Bawn," now being played every night at the new Aldelphi Theatre.

It appeared from the affidavits that upon the 12th inst the plaintiff first knew of the intended production at Manchester by the defendant of the "Lost Bride," but that he had been unable to obtain a copy of the manuscript from the licenser's office until the 16th. He then discovered that the incidents in the two scenes were exactly similar, with only some colourable and unimportant variations in the dialogue.

The scene in the "Colleen Bawn" alleged to be thus pirated is that of which a description appears in the daily Adelphi advertisement as that in which Eily O'Connor is plunged into the lake by Danny, Danny is shot by mistake for an otter by Miles, and Eily is rescued from a watery grave by Miles, who, as stated in the advertisement, takes a tremendous "header" for that purpose.

Considerable amusement was created in court when these exciting incidents were read out by the learned counsel, and the two MSS. were handed up to enable his Honour to compare them.

The Vice-Chancellor granted an interim order, extending over the next Seal-day (Monday, the 26th).

Furnaces and Boilers: Prideaux *v.* Darby.—This was an action in the Court of Queen's Bench, before Mr. Justice Crompton and a special jury, for the infringement of a patent granted to the plaintiff in 1849 "for improvements in puddling and other furnaces and in steam boilers." The trial occupied the whole of two days, and in the result the jury found a nominal verdict for the plaintiff, it being reserved for the full Court to decide upon the specifications and evidence adduced whether the plaintiff's was a new invention, or whether it had not already been anticipated by others which had become public property or been purchased by the defendants.

REGISTERED DESIGN.

FENCE STANDARD.

Registered for Messrs. Keenan & Sons, *Fishamble Street, Dublin.*

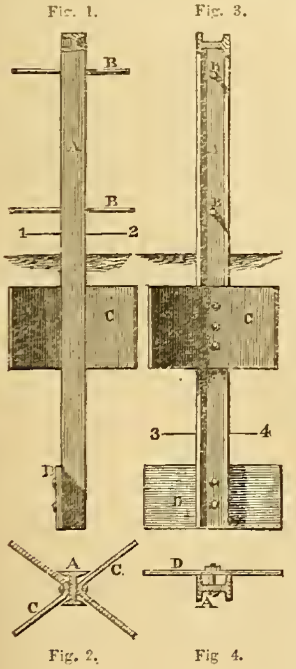


Fig. 1. Fig. 3. Fig. 2. Fig 4.

We had occasion to notice last month Messrs. Keenan's tangential strainer for iron fences, and following closely upon that design, we have another for a fence standard. The purpose of utility to be secured by the shape or configuration of this design, is the obtainment of increased stability and lightness in the standards of strained wire fences. Figs. 1 and 2 of the annexed engravings represent an elevation and transverse section taken on the line 1, 2, of the registered form of standard, or intermediate upright for strained wire fences, the upper part of the upright being broken away. Fig 3 is an elevation taken at right angles to fig. 1, and fig. 4 is a transverse section taken on the line 3, 4 in fig. 3. A, is a wrought iron upright rolled to an H section, and having near its lower end two L pieces, C, (fig. 2) of thin flat metal bolted or riveted to opposite sides of the upright, and across the lower extremity of the upright is riveted a flat plate, D, fig. 3, the object of such attachments being to steady the upright and hold it firmly when in the ground, as shown. The wires, B, of the fence are passed through holes drilled for that purpose in the web of the upright. The whole of the parts of this design as here combined, are registered as novel and original in shape and configuration.

MECHANIC'S LIBRARY.

Arithmetic for Schools, Key to, 2d edition, crown 8vo., 8s. 6d. Smith.
Chemistry, Every Day, post 8vo., 2s. 6d., cloth. Sibson.
Culture of the Peach, Nectarine and Apricot, 2s. Harrison.
Cordon, Training of Fruit Trees, foolscap 8vo., 3s 6d., cloth. Brêhaut.
Geology, Supplementary Chapter to Acadian, crown 8vo., 2s. Dawson.
Laboratory of Chemical Wonders, crown 8vo., 5s. 6d., cloth. Piesse.
Marine Steam Engine, 4th edition, 12s. 6d. Main and Brown.
Physical Geography of the Sea, new edition, 8vo., 12s., cloth. Maury.

REVIEWS OF NEW BOOKS.

On the Construction of Iron Ships. By Thomas Shedden, M.A., of Ardgartan House, Arrochar. 8vo. Pp. 11.

Perhaps no subject is attracting so much attention amongst the practical engineers of our time—and most deservedly so—as the consideration of what is the proper construction of iron ships. Very recent casualties, some of them of a fearfully alarming nature, have shown that there is even yet very much to be learnt as effecting this subject—showing that although iron ships (comparatively speaking) have proved a splendid success; but proving also that they have lamentably often turned out to be equally splendid failures. Mr Shedden, who, although not a practical shipbuilder, has given much of the practical attention of a thoroughly observing man, to the subject which he has chosen to attempt to elucidate; and he has here put together his views in a clear and instructive manner, and he thus opens his case:—

"Among the numerous shipwrecks that occurred towards the close of the past year there were two which have called forth much remark, not only from the loss of life and property that attended them, but also from their being the wrecks of large iron sea-going steamers, and affording us some means of judging how far the present system of constructing that great and most valuable class of our mercantile navy is adequate to the requirements of circumstances in which every ship is liable to find herself. The wrecks to which I allude are those of the *Royal Charter*, near Moelfra, and of the *Indian* on a reef of rocks off the coast of Nova Scotia. The *Royal Charter* was cast on shore in one of the most violent hurricanes that have been experienced for many years upon our coasts. The ship soon broke in two, the engines going through her, and almost immediately afterwards both parts of the vessel sank. It is impossible now to say how much of the ships' bottom was damaged by beating on the rocks, and whether or not there were holes knocked in all of the compartments; but one thing is certain, viz., that the water must have had access to them all; for had any of them remained tight, that portion of the wreck would, when relieved of the weight of the machinery, have been driven further on the rocks by the action of the waves, instead of immediately sinking. It is most probable that the strain on the ship had torn the plates, and started the rivets not only in the water-tight bulkheads, but also in the outer sheathing of the ship—that strain having been thrown on the plates from the deficiency of the system on which she was built.

"The *Indian* went on a reef of rocks in tolerably calm weather; for even in the swell upon the reef, all the boats might probably have been launched without accident, had more presence of mind been shown by some of the passengers who perished. Still the ship parted, the fore part falling over on its beam ends and the after part remaining upright. This easy separation can only be accounted for by weakness of construction.

My present object, however, is not to show that the *Royal Charter* and *Indian* were badly built individually, but that the whole class of large iron vessels is constructed in an insufficient manner, and that iron shipbuilding has not progressed in the principles of construction, while all other engineering works in which the same material is employed have been, and are daily being rendered more perfect by the advance of constructive invention."

He then proceeds to compare the two distinct systems of boat and shipbuilding, explaining clearly how they so essentially differ, making allusion to the clinker and carvel varieties of boatbuilding, and briefly describing the modes of shipbuilding. The diagonal system of planking, which was tried by Messrs. White, is also adverted to. The properties of iron in connection with its application to shipbuilding is then passed under review, which leads to some valuable remarks on the principles of construction of iron ships. Mr. Shedden points out a highly important defect in the ordinary mode of construction.

"When the vessel is very large, additional strength is gained not by any improvement in the method of construction, but by increasing the number of frames, by increasing the weight of the iron of which they are formed, by increasing the weight of the sheathing plates, and by increasing the number of keelsons, and making them not of angle-iron merely, but of made-up angle-iron, or, in other words, by making them simple girders. The whole strength of an iron vessel, then, lies in her keel and keelsons, her frames, her plates, and her decks, and in any system of longitudinal tying, other than the planking, that may happen to exist among her deck beams. The frames add strength to the plates by preventing them from collapsing, but they do not directly guard against either a longitudinal strain, or a strain of transverse torsion. The former is borne by the plates, keel, keelsons, and decks (and stringers, if there be any), the latter by the plates only, for the resistance of keel and keelsons to a torsion force must be comparatively small, and the decks will not help much, for decks are carvel not clinker built."

This state of things may unquestionably be obviated by paying due attention to the form which should be given to the materials in order to obtain the greatest amount of strength with a given weight of metal.

"The employment of tubular girders in the skeleton of large iron ships would introduce one important element of strength of which I have never heard mention in the details of the construction of any vessel, however large, *

* Shortly after the above was written, the details of the iron steam rams now building for Government were published. In their construction the box or tubular girder is largely employed.

"In a vessel which is not built as a tubular ship, the principal keelson should be the real strength of the framework, the principal bone of the skeleton. It should be a tubular, and not a simple girder, and should always be continued, as in men-of-war, up inside the stem and stern posts, to a level with the upper deck. At certain distances, notably wherever there is to be a water-tight bulkhead, the frames should be constructed upon the same principle. Under the deck-beams there should be at least one, and in a large vessel three or five, tubular girders running the whole length of the ship, the centre one being firmly bolted at each end to the inner stem and stern posts, and connected with the principal keelson, by frequent vertical tubular supports. The side-girders, when required, should correspond with the sister keelsons, and be connected with them by vertical supports. Their ends should (as also the ends of the sister keelsons) be bolted to tubular frames, and from the points of junction tubular stays should be carried to the inner stem and stern posts. Diagonal staying among the tubular frames should be employed in large vessels, not only between the ribs, but between the deck-beams: for diagonal stays are the best resistance we can give to transverse torsion. The frames should also be tied together at their superior angles by a tubular girder running along each side of the ship under her upper deck; and in large vessels this, and rectilinear longitudinal girders, should be repeated under one or more of the other decks, according to the size of the vessel. A system of this kind will construct a large vessel of a strength, and with such a small quantity of material, as could not be done on the present plan; for a tubular girder, compared with a simple girder, may be defined to be a construction for obtaining a greater amount of strength with a smaller quantity of material."

Further details are given, which are both interesting and important, and there are few who would not derive much useful information from Mr. Shedden's *brochure*.

CORRESPONDENCE.

LATHE HEAD.

I SEND for the use of amateurs in mechanics the accompanying sketch of a lathe head, which is cheaper and more easily made by an amateur than the usual expensive headstock, in which the fitting and grinding of the mandril form a great difficulty, except to a skilled workman.

Fig. 1 is a longitudinal sectional elevation, and fig. 2 a front end elevation of the arrangement. The bed, A, of the lathe is fitted with the pointer, B, for the dividing plate, which is arranged on the face of the pulley, F. The poppet, C, is of cast-iron, tapped throughout to receive the screwed mandril, D. A brass ring is countersunk in the face of the poppet, against which the boss of the pewter collar, E, runs. The wooden or metal pulley, F, is bored throughout, and tapped with a

Fig. 1.

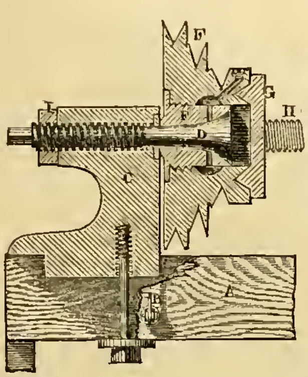
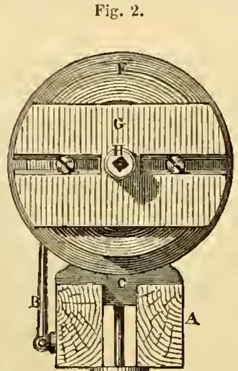


Fig. 2.



coarse thread for part of its length. The pewter collar, E, is cast round the mandril, and fills up the intervening space. In the pulley, F, there is formed an oil channel or reservoir, with two small holes for lubricating the mandril and collar. The external opening to the oil chamber is stopped by a small screw. An eccentric slide, G, carries the chuck screw, H. This slide is tightened by set screws, shown in the front view, fig. 2. The pulley runs on the mandril, D, and the curve given to it ensures easy running without any shake. The mandril is tightened to the collar by turning the square head at the backward end of the mandril, which screws it backward, and it is then locked by the jam-nut, I. In moving the dividing plate for ornamental work, the right hand of the operator turns the pulley, and the left adjusts the pointer, B. This is the reverse of the usual way, but soon becomes as easy.

Rochester, Dec., 1860. T. E. MERRITT.

WHAT STEAM CAN DO ON THE FARM.

I BEG to submit the inclosed to your notice. It shows that I have not only finished my harvest, but my wheat seeding; and well too.

Surely there must be some value in a system that can thus expedite matters in a late season, especially when the crops and cleanliness of the land are taken into account. See my swedes and mangolds, grown without a handful of artificial manure, and in a bad season.

I finished my harvest, carting the last of my beans on the 22d of October, earting all well.

Heavy Land.—Field No. 1, barley stubble remarkably clean; No. 2, swedes, very good, land very clean; No. 3, 12 acres bean stubble, smashed up, and drilled wheat, cost of seed bed 7s. per acre; the sixth corn crop under steam, lays nicely; No. 4, wheat stubble, very clean and strong, cutting the stubble.

Light Land.—No. 1, clover-lea 12 acres, mown twice for hay, ploughed with horses, clean, wheat drilled up, and looks well; No, 2, 13 acres, bean stubble, very clean, smashed-up and drilled wheat, worked well; No 3, wheat stubble, very clean; No. 4, barley stubble, remarkably clean with a fine plant of clover in it; No. 5, oat stubble very clean; No. 6' mangolds and swedes, all pulled and stacked. The mangolds, there are 858 roots on 22 yards square, weighing 3 tons 2 cwt. 8 lb., giving a weight of 31 tons and 80 lb. per acre. The swedes, there are per acre 11,440 roots; 1430 bushels, 56 lb. per bushel; 35 tons 15 ewt.

The working of my steam tackle 12 days and of my horses 10 days will smash up Nos. 1 and 4 heavy land and 3 and 5 light land, and put them in the best possible form for the winter, ready for planting beans and roots in the spring.

My farm is open to the inspection of all.

WILLIAM SMITH.

Woolston, Bletchley Station, December, 1860.

STREET RAILWAYS.

THE proposals which have of late been repeatedly made for laying some main thoroughfares of London with rails, so that the surface resistance to omnibus and other carriage wheels may be reduced and the demand for horse traction also lessened, may be deemed by you to be worthy of some further examination before being adopted anywhere else than on a level line of way.

The success of very heavy omnibus work on rails laid flush with some roadways in Paris and in New York must not be expected in London. In Paris and New York such arrangements are only employed when the line is nearly level throughout. In all the main streets of heavy traffic in London we miss the level. I do not know what are the gradients of Ludgate Hill and Fleet Street, Charing Cross and the Haymarket, Tooley Street and Wellington Street, Borough, Snow Hill and Holborn Hill, but all of them are far from being level, and the locality of each of them is just where carriages and carts crowd the most and stop the way.

There are four well known forces which resist the power of traction on all roads—"friction of axles and bearings," "collision," "gravitation," and "surface resistance." The last is all that we can reduce to a *minimum* by a railway. A flat iron tramway, such as has been common in many cities, or a hard stone tramway, such, for instance, as used to be kept in good condition on the Commercial Road, reduces "surface resistance" in measure little less in degree than a railway does. They offer advantage to most other carriages, and all carriages (even those with railway wheels) can draw off or on, or across, or deflect from them. On none of the three is the horse's foothold secure and the fetlock and hoof safe from damage.

Suppose the gross weight of a Parisian monster omnibus and its passengers (or a waggon) shall be four tons, the power necessary for hauling that weight at any speed on a dead level is well known to be, on an iron railway, 40 lb.; on cast iron plate way less than 50 lb; on well-dressed granite or other very hard stone surface, 50 lb.; on best London pavement, 89 lb.; on good London pavement, 128 lb.; on broken stone road of best character and in perfect condition, 172 lb. On loose broken stone road, on bad foundation, I have seen Sir John M'Neil's dynamometer indicate 140 lb. per ton, which would be for four tons 560 lb., and on the loam surfaced road at the Quai de Bailly, at Paris, the demand for horse-power must be often as great. There the heavy Paris omnibus now travels on a railway almost level, and thereby the horse-power required is only 40 lb. or 50 lb. instead of 560 lb. This indeed is a saving of great amount, but the position is peculiar.

Whenever the rails are inclined the saving diminishes; it vanishes very fast as the gradients increase, because the resistance of gravitation increases.

"When a body—say the above-mentioned four tons—is drawn up a vertical plane, the whole weight of the body is sustained by the power that draws or lifts it up; hence the power is equal to the weight.

"When a body is drawn along a horizontal (truly level) plane it requires no power to draw it save that necessary for moving it in opposition to 'surface resistance.'

"From these two hypotheses, if a body is drawn up an inclined plane the power to raise it is as the inclination of the plane."

Here I may venture to offer a short table which exhibits the power required for the movement of the said four tons weight on the level, and up certain rates of ascent.

The seventh report of the Holyhead Road Commission confirms these views:—

	On Railway.	On flat Iron Plates or Granite Slabs.	On best London Pavement.
On a Level ...	40lb. ...	50lb. ...	89lb.
Up 1 in 300 ...	69¾ ...	79¾ ...	118¾
Up 1 in 100 ...	129¼ ...	139¼ ...	178¼
Up 1 in 50 ...	219¼ ...	229¼ ...	268¼
Up 1 in 30 ...	338½ ...	348½ ...	387½
Up 1 in 15 ...	637½ ...	647½ ...	686½
Up 1 in 16 ...	936 ...	946 ...	985

If the acclivity of St. James' Street may be about 1 in 85 the saving of traction by a rail, when compared with a flat tram or granite tram would be less than 4 per cent., and that could ouly be had by great outlay of money and great inconvenience to many, not forgetting the gas companies and water companies, who must disturb it every six weeks, of course.

ALEXANDER GORDON, M. Inst. C.E.

Little Fife House, December, 1860.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL SOCIETY.

NOVEMBER 18.

"On the laws of the phenomena of the larger disturbances of the magnetic declination in the Kew Observatory, with notices of the progress of our knowledge regarding the magnetic storms," by General Sabine.

SOCIETY OF ARTS.

NOVEMBER 21.

The following is the list of prizes presented at the opening meeting:—

To Mr. R. Thomson, for several novel and ingenious instruments, for use in dental surgery. *The Society's Silver Medal.*

To Mr. Leonard Wray, for his compound of materials as a substitute for gutta percha. *The Society's Silver Medal.*

To Mr. J. C. Morton, for his paper read before the society, "On the forces used in agriculture." *The Society's Medal.*

To Mr. Leonard Wray, for his paper read before the society "On the means of increasing the prodnction of sheep's wool, and angora goat's hair." *The Society's Silver Medal.*

To Mr. George R. Burnell, for his two papers read before the society, "On building stones—the causes of their decay and the means of preventing it," and "On building woods—the causes of their decay and the means of preventing it." *The Society's Silver Medal.*

"On a new system of bread manufacture." *The Society's Silver Medal.*

To Dr. J. Forbes Watson, F.R.S., for his paper read before the society, "On the chief fibre-yielding plants of India." *The Society's Silver Medal.*

INSTITUTION OF CIVIL ENGINEERS.

SESSION, 1859-60.

THE Conncil of the Institntion of Civil Engineers have awarded the following Premiums:—

A Telford medal, and a conncil premium of books, to James John Berkley, M. Inst. C.E., for his paper, "On Indian railways, with a description of the Great Indian Peninsula railway."

A Telford medal, to Richard Boxall Grantham, M. Inst. C.E., for his paper, "On arterial drainage and outfalls."

A Watt medal, and the Manby premium in books, to James Atkinson Longridge, M. Inst. C.E., for his paper, "On the coustiuction of artillery, and other vessels, to resist great internal pressure."

A council preminm of books, to Edward Leader Williams, M. Inst. C.E., for his "Account of the works, recently constructed upon the river Severn, at the Upper Lode, near Tewkesbury."

A council preminm of books, to Edward Brainerd Webb, M. Inst. C.E., for his paper, "Upon the means of communication in the empire of Brazil, chiefly in reference to the works of the Mangaratiba Serra Road, aud to those of the Mauá, the first Brazilian railway."

A conncil preminm of books, to Francis Croughton Stileman, M. Inst. C.E., for his "Description of the works and mode of execution adopted in the construction and enlargement of the Lindal tunnel, on the Furness railway."

A council preminm of books, to James Ralph Walker, M. Inst. C.E., for his "Description of the Netherton tunnel branch of the Birmingham canal."

A conncil premium of hooks, to Daniel Kinnear Clark, Assoc. Inst. C.E., for his paper, "On coal-bnrning and feed-water heating, in locomotive engines."

NOVEMBER 13.

Before commencing the ordinary business, the President reminded the assembled members, that at the opening of the last session, they had heard from the then President, Mr. Locke, a most feeliug address announcing the deceases of those two distinguished members of the profession, Mr. Brunel and Mr. Robert Stephenson. How little was it imagined, that the lips which then uttered the fervent eulogy upon the memories of his departed friends, would so soon be hushed in the silence of the grave. Another of the leaders had passed away, cut off in the prime of life, and in the full vigour of his intellect. In Mr. Locke, the profession had lost one of its most eminent members, whether regarded professionally or socially, and the Institution one of the ablest presidents who had occupied that distinguished position. Sprung originally from that great nursery of practical engineers, the works at Newcastle-on-Tyne, Mr. Locke acquired there bis mechanical knowledge, and his unbounded confidence in the powers of the locomotive engine. He was soon transplanted to co-operate with the late Mr. George Stephenson, in several of his early works, and nearly at the commencement of the construction of the Grand Junction Railway, the separation occurred into the causes of which it was as unnecessary as it would be invidious to enter. Mr. Locke possessed peculiar qualities of mind which secured for bim the confidence of capitalists, by whom the construction of the Grand Junction Railway was entrusted to him. At an early period of the railway epoch he became the engineer of the South Western line, whence he almost naturally sought for and ultimately accomplished the extension of the system to France; where, in the construction of the Paris and Rouen, and Rouen and Havre lines, he introduced English capital, English workmen, and English contractors, and initiated the Continental railway system. He was thus the first who promoted the establishment of the present rapid communication between the great commercial capitals of Great Britain and Paris. Returning to the field of his early labours, he undertook the extension of the lines from Preston to Carlisle, and thence to Glasgow, Edinburgh, and, ultimately, to Aderdeen, thus becomiug also the pioneer of the Scotch railway system. There was a curious coincidence in the circumstances of the deceases of the three distinguished men who had been removed within little more than a year. Each one had departed on the eve of, or at the completion of, some great work. Mr. Brunel might be said to have died as the *Great Eastern* steamer commenced its trial voyage. Mr. Robert Stephenson was taken away on the eve of the completion of the great Victoria Bridge over the river St. Lawrence, Canada; and Mr. Locke's decease occurred on the completion of his long-cherished project—the extension of the narrow gauge line to Exeter, the capital of the West of Englaud.

The discussion upon Mr. Scott's paper "On breakwaters, part 2," which was commenced at the closing meeting of the last session, but was not then concluded, was continued.

DECEMBER 11.

The discussion upon Mr. Preece's paper "On the maintainance and durability of submarine cables in shallow waters," was continued throughout the eveuing.

DECEMBER 18.

"Annual general meeting." Reading of the annual report, and ballot for council.

INSTITUTION OF MECHANICAL ENGINEERS.

AUGUST 8.

"On the ten yard coal of South Staffordshire, and the mode of working," by Mr. William Mathews.

"Description of a method of taking off the waste gases from blast furnaces," by Mr. Charles Cochrane.

It is proposed to give a description of an arrangement which has been in successful operation for some months at the Ormesby Iron Works, Middlesborough, and bids fair to realize the best expectations of its merits. The large waste of fuel from the mouth of a blast furnace where the escaping gases are allowed to burn away is well known, and amounts to more than 50 per cent. of the fuel burnt; hence there is considerable margin for economy, bearing in mind the large quantity of coals consumed in raising steam for generating the blast and the further quantity necessary to heat that blast to the required temperature. In fact assuming a consumption of 300 tons of coke per week to make 200 tons of iron, about 100 tons of coal would be required to generate steam and heat the blast. Taking off the gases from one furnace under such conditions does according to actual experiment furnish gas equivalent to upwards of 150 tons of coal per week. This is obviously an important matter where coals are expensive.

The blast furnace is alternately charged with coke, ironstone, and limestone, in proportions depending upon the quality or "number" of iron desired. The arrangement of these materials in the furnace is generally deemed important, though it admits of considerable latitude without any appreciable alteration in the working of the furnace. Thus it does not seem to be of any importance whether the charge of coke be 12 cwts. or 24 cwts., the amount of load of ironstone and limestone being in the same proportion of 1 to 2. The chief point, if there be one, to be gained in the arrangement of the material is to distribute it pretty equally over the furnace, not allowing all the large material to roll outwards and the small to occupy the centre of the furnace, or *vice versâ:* for it is supposed the ascending gases will pass through the more open material of the furnace to the injury of the closer; thus the two reach the active region of reduction in different states of preparation, and the operations of the furnace are interfered with. To provide for this contingency, which is met in an open-topped furnace by filling at the sides at three, four, or even six points of the circumference of the throat, allowing the material to slide inwards 2 or 3 feet on a sloping plate, it was considered expedient in the present instance to make the filling aperture as large as practicable: it was therefore made 6 feet 6 inches diameter, so that the material tends to arrange itself in a circle a little outside the centre, thus correcting the tendency of large material to roll outwards by causing a similar tendency to roll towards the centre also. This point is gained in one of the simplest methods in use for closing the top of a blast furnace, where a cone is used to lower into the furnace for filling; but it is secured at the expense of the height of material in the furnace. A certain height is necessary for the efficient working of the furnace, and if this be diminished it must be at the expense of fuel in the furnace, since the absorption of heat from the gases depends on the height of material through which they have to pass up: if this be diminished, the gases issuing from the throat of the furnace will escape at a higher temperature; if increased, at a lower.

The top of the furnace is closed by a light circular wrought iron valve, 6 feet 6 inches diameter, with sides tapering slightly outwards from below, to admit of being easily drawn up through the materials, which are tipped at each charge into the external space. To prevent excessive wear upon the body of the valve, shield plates are attached at four points of its circumference, against which the material strikes as it rolls out of the barrows. An annular chamber encircles the throat, triangular in section, into which the gas pours through eight orifices from the interior of the furnace, and thence passes along a rectangular tube into a chamber. At the extremity of the tube is placed an ordinary flap-valve opened by a chain, by means of which the communication between the furnace and the descending gas main may be closed. The valve is partially counterpoised by the balance weight at the free extremity of a lever, and is opened by a winch when the space is sufficiently full of materials. At the time when the blast is shut off for tapping the furnace, the gas escapes direct into the atmosphere through a ventilating tube which is connected by levers with the blast inlet valve below.

The waste gases, which pass down the angular descending main into a horizontal main running parallel and close to the line of stoves, from which descend smaller pipes to each stove. The supply of air for burning the gas in the stoves is admitted through three tubes, and can be regulated at pleasure by a circular slide closing the ends of the tubes, which has an aperture corresponding to each tube, and is planed on the rubbing face, as is also the surface against which it works, in order that the slide may be sufficiently air-tight when closed. The ignition takes place where the air and gas meet, the ignited gas streaming into the stove and diffusing its heat uniformly over the interior. An important element in the working of an apparatus of this description is to provide for explosions, which must take place if a mixture of gas and air in certain proportions is ignited. To provide for this contingency, escape valves are placed at the ends and along the tops of the main tubes: but to prevent explosions as far as possible, a ventilating tube is used at the top of the furnace, connected with the blast valve at the bottom, so that when the valve is closed, as at casting time, the act of closing opens the ventilating tube and allows the gas to pass away direct into the atmosphere. The gas would otherwise be in danger of slowly mixing with air passing back through the stoves or otherwise gaining access into the tubes, and would thus give rise to an explosion; until the ventilating tube was provided, it was necessary to lift the valve closing the mouth of the furnace when the blast was taken off, otherwise slight explosions took place from time to time.

The writer has heard it asserted that the closing of the top of the furnace is the source of mischief to its working by producing a back pressure in it. Under ordinary circumstances, with the furnace top open, the blast enters the tuyeres at a pressure ranging from 2½ to 3 lbs. per square inch. In the present close-topped furnace there are eight outlet orifices, each 2 feet by 1 foot, giving a total area of 16 square feet for the passage of between 5000 and 6000 cubic feet of gas per minute raised to a temperature of 450° Fahr.; and the actual back pressure of the gas as measured by a water gauge inserted into the closed top of furnace is from ½ to ⅝ inch column of water, or about 1-40th or 1-50th of a pound per square inch, an amount so trivial as compared with a pressure of from 2½ to 3 lbs. as to be unworthy of notice. Of course if the tubes are contracted in size a greater back pressure will be produced; and it is quite possible that, where attention has not been paid to the circumstance, the back pressure may have interfered with the working of the furnace by preventing the blast entering so freely.

As regards economy in the wear and tear of hot-blast stoves of the ordinary construction, there can be no question the pipes last much longer when heated by gas, provided the temperature of the stove be carefully watched to prevent its rising too high; whilst the value of the same heating surface compared with its value when coals are used is greatly increased, owing to the uniform distribution of the ignited gases throughout the stove: in the use of the gases at the writer's works, this economy of surface is such that two stoves heated by gas will do the work of a little more than three heated by a coal fire.

NOVEMBER 1, 1860.

"On taking off the waste gas from open-topped blast furnaces," by Mr. S. Lloyd of Wednesbury.

"On a new safety coupling for railway waggons," by Mr. C. Markham of Derby.

"On an improved steam hammer for light forgings," by Mr. R. Peacock, of Manchester.

In this hammer the steam is admitted on the top of the piston when desired, for increasing the force of blow given, by means of a slide valve worked entirely by hand, and having an arrangement for varying the lap of the slide whilst working. It is a cylindrical balanced valve, with a long lap at the top end, extending round half its circumference; and by turning the valve round by a handle the entrance of steam on the top of the piston is regulated or cut off entirely. A specimen of the cylindrical valve and valve chest was shown; and an improved attachment of the piston rod to the hammer block was described, serving to prevent fracture of the rod by oblique strains in working. A large number of indicator diagrams were shown, taken from the top and bottom of the hammer cylinder when working both double acting and single acting; which showed that the force of blow is more than trebled by using steam on the top of the piston, while the hammer can be worked at a greater number of blows per minute.

GEOLOGICAL SOCIETY.

NOVEMBER 7.

"On the denundation of soft strata," by the Rev. O. Fisher.

"On an undescribed fossil fern from the lower coal-measures of Nova Scotia," by Dr. J. W. Dawson.

"On the sections of strata exposed in the excavations for the south high-level sewer at Dulwich; with notices of the fossils found there and at Peckham," by C. Rickman, Esq.

INSTITUTE OF BRITISH ARCHITECTS.

NOVEMBER 19.

"On architectural drawings," by Mr. W. Burges, in which he described a number of ancient drawings, beginning with the eighth century, and commented on the style at present in use.

"On architectural drawings," by Mr. G. Godwin.

ASSOCIATION OF FOREMEN ENGINEERS.

NOVEMBER 3, 1860.

After the elections and nominations of the season, Mr. J. Newton, who presided, urged upon his brother members the paramount necessity of preparing papers for the monthly meetings of the coming year. He knew that it required an effort and some self-denial for foremen engineers, whose working hours were long and usually incessantly occupied, to sit down to the composition of elaborate papers, and the getting up of diagrams to illustrate them. But then there was the fact that they thoroughly understood the subjects with which they had to deal, and that was more than half the battle. Besides, lengthy communications were not so much required as suggestive ones. His desire was to see the principle of ample discussion fully carried out, so that mutual information might be the result. It would be discreditable to the Association, which comprised so many clever and persevering men, if they had not always—notwithstanding the pressure of onerous duties—plenty of notices of papers to be read on their lists. Mr. Newton then announced that Mr. John Briggs would, at the next meeting in December, favour the Association with his views on the "Resistance offered by cast-iron to internal pressure."

The eighth anniversary dinner of this useful society was held on Saturday the 15th ult., at the "Bay Tree," St. Swithin's Lane, when the effective and honorary members, with their friends, to the number of eighty, sat down to an excellent repast, presided over by the worthy president of the association, Mr. Joseph Newton of the Royal Mint. The cloth being removed, before proceeding with the toasts of the evening, the chairman read a letter of apology from Mr. Henry Grissel, who was to have filled the chair, but was unfortunately prevented by indisposition. Although we should have been glad to have seen an employer of Mr. Grissel's standing occupying the chair at the Foremen Engineers' dinner, yet we must confess that the substitute amply made up for any loss on that score.

The usual loyal toasts of "The Queen," "The Prince Consort, Prince of Wales, and the rest of the Royal Family," having been responded to in the very hearty and loyal manner peculiar to Englishmen, and the National Anthem having been sung, the toast of "The Army, Navy, and Volunteers," was proposed, when Mr. C. F. Hayes of the Small Arms Factory, Enfield Lock, Lieutenant of the 41st Middlesex Rifle Volunteers (Enfield Lock Corps), returned thanks on behalf of his fellow comrades in arms. "Our Employers," was the next toast proposed, in giving which, the Chairman alluded to the prejudice still entertained by some employers against the association, and stated that the society looked to the scientific press as a means of drawing the attention of employers generally to the society, and of removing from their minds all doubts and prejudices as regards the object and working of the association. Mr. Fowler replied on behalf of the employers, in an appropriate address, when the toast of the evening, "Prosperity to the Association of Foremen Engineers," was proposed and acknowledged in an enthusiastic manner.

The able secretary, Mr. J. Jones of Arlington Square, New North Road, then read a statement of the origin and progress of the society, but as we hope to be in a position to lay this report *in extenso*, before our readers, we refrain from giving any abstract of it here; suffice it to say that it shows the society is no longer an infant, but has arrived at the age of adolescence, if not of maturity. Its members and funds are both on the increase, and, we are happy to say, promise to continue so.

"The other scientific societies of Great Britain" was the next toast, which was responded to by Mr. W. E. Newton, of Chancery Lane. With other good advice, Mr. Newton suggested the advisability of the association placing itself in communication with the Society of Arts, so as to be in union with that society, and in a position to receive and enjoy the various benefits and privileges accruing therefrom. Mr. Newton offered his assistance in carrying out this laudable object, whenever the association might decide upon such a course. In speaking of the scientific press, Mr. Newton assured the association that, far from despising it as an insignificant body, that portion of the press took the greatest interest in the welfare of the society, and watched over it with solicitude. In conclusion, he urged upon the individual members the necessity of getting up papers regularly, to be read or discussed, at the monthly meetings, as nothing tended to deaden the life of a society of this kind so much, as the want of papers for regular discussion. He was fully aware of the difficulties to be encountered when the members were occupied early and late at there ordinary avocations, but still, by taking notes of any simple appliance or improvement which might occur to them in the course of their labours, they might easily get up abundance of interesting matter for discussion, which, from the interchange of ideas involved, would often be of great service to the community.

"The Scientific Press" was next given, and was very ably responded to by Mr. J. Passmore Edwards, who represented the *Mechanic's Magazine*, on that occasion. After an eloquent address, Mr. Edwards begged to offer himself as an honorary member, and to present to the recently formed library of the society, a complete set of the *Mechanic's Magazine*.

The toast of the "Honorary Members" was next drunk, and responded to in a neat speech by Mr. Robertson, who felt sure that employers did not understand the principle and working of the association, otherwise, they would never object to their managers uniting for the intercommunication of new ideas and suggestions, which had the effect of storing their minds with knowledge to be used for the benefit of those employers.

We quite agree with Mr. Robertson, and think that so far from employers viewing with distrust the existence of such a society, they ought to encourage it in every possible way, if only for the direct gain to themselves; for we assert that it is impossible for an intelligent body of men to meet together for the discussion of scientific questions, without some one or more picking up an idea which had not previously occurred to him, to be afterwards matured and turned to good account. In one word, we ask, does the greater or lesser ability of the foreman, influence or not the bankers' balance of the employer? There can only be one answer to the query.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

September 17, 1860.

A specimen of envelopes was exhibited by the Secretary, such as were proposed to be sent to captains of vessels, in which to preserve soundings they obtain in different parts of the world, for this section. The envelopes were much approved of, and were thought likely to be productive of future interest to the section, and to microscopists in general.

Mr. Latham referred to Mr. Hepworth's method of mounting insects in Canada balsam, and described his own experience of the same. Mr. Latham spoke in very favourable terms of the facility with which slides can be washed off and finished. He found that the balsam should be as thick as possible, almost even to dryness; then dissolved in chloroform, to a consistence only thin enough to flow easily under the thin glass; the object having previously been mounted by Mr. Hepworth's process, under thin glass tied on with thread, exhausted of air, and saturated with turpentine. After heating over a spirit-lamp the balsam sets hard almost as soon as cool, when the slide, after cleaning with alcohol, is ready for the cabinet. Mr. Latham exhibited several slides thus mounted, with specimens of the gizzard of a cricket, saw fly, entire system of the silk-worm trachea, ichneumon fly, spiracle of the silk-worm, goldfish scale, leaf of wheat showing spiral vessels.

October 11, 1860.

Some conversation took place respecting recent storms, and the bearing of the new weather tables, given in the *Times*, on their theory, as Mr. Baxendell remarked that according to these observations the wind did not blow from the areas of greater pressure.

Mr. Baxendell called attention to certain phenomena of solar spots recently observed by him, and stated that in cases in which projections of the penumbra into the nucleus occurred, the penumbra is generally increased in breadth in that part of its circumference, and it often happens that striations observed in the penumbra are curved, and terminate in the points of projection into the nucleus.

"On the atomic constitution of water and ice," by Mr. Thomas Carrick.

October 16, 1860.

Dr. R. Angus Smith gave a short account of his examination of coal pyrites for arsenic. He stated that although the knowledge of the existence of arsenic in the iron pyrites found in coal may not be considered perfectly novel, it certainly does not seem to be known that arsenic is so widely disseminated as to form an ordinary constituent of the coals burnt in our towns, and chemists of celebrity have held it—and now hold it—to be absent there. He had examined fifteen specimens of coals in Lancashire, and found arsenic in thirteen. He had also found it in a few others; but Mr. Binney having promised a collection, properly arranged, the examination will then be made more complete. Mr. Dugald Campbell had also lately found arsenic in coal pyrites. The chairman added, that this had a very direct bearing on our sanitary knowledge, as we must now be obliged to add arsenic to the number of impurities in the atmosphere of our large towns. It is true that he had not actually obtained it from the atmosphere, but when the pyrites is burned the arsenic burns and is carried off along with the sulphur. One or two coal brasses (as they are called) contained copper, a metal that is also to some extent volatilised, as may be readily observed wherever copper soldering takes place. Although an extremely small amount of copper is carried up from furnaces, it is not well entirely to ignore it. The amount of arsenic, however, is probably not without considerable influence, and we may probably learn the reason why some towns seem less affected than others by the burning of coals, by examining the amount of arsenic burnt as well as sulphur.

Mr. Spence said that he could confirm the remarks concerning the existence of arsenic in coals, as he had burnt coal pyrites for many years, and had always found a very decided amount of arsenic in the sulphuric acid made from it.

Mr. Ransome called attention to the peculiar symptoms described by Berzelius, as produced by selenium; and he considered that some similar symptoms were produced in a manner which might be explained if selenium were found in coals

"On the estimation of sugar in diabetic urine by the loss of density after fermentation," by William Roberts, M.D.

MONTHLY NOTES.

MARINE MEMORANDA.

The handsome screw steam yacht *Taganrog*, built by C. Mitchell & Co., Newcastle, for the Russian Government, made her trial trip in the Tyne, at the measured mile, on the 8th December; her average speed was 11 miles per hour. Her engines are by Robert Morrison & Co., of Newcastle, of 30 horse power nominal; pressure of steam in the boilers, 20 lbs.; number of strokes, 120 per minute; consumption of coals, 4 cwt. per hour.

The naval force of Spain as it will stand for the coming year will be:—a sailing ship of 84 guns, a frigate of 42, two corvettes carrying together 60 guns, two brigs with 32 guns between them, and two transports of 2,748 tons. Screw steamers.—Three frigates, mounting in all 115 guns, and with machinery of the force of 1,460 horse-power; four schooners, with 10 guns and 340 horse-power; and six transports of 7,300 tons and 1,310 horse-power. Six paddle-steamers, carrying together 40 guns, and moved by machinery of 1,930 horse-power. In addition, the Coastguard service of the Peninsula includes two screw steamers with four guns, and of 764 horse-power; two despatch boats, with four guns, two luggers, with a gun each; 25 feluccas and 73 other craft. The total force of Spain, then, colonies not included, may be taken at 25 armed vessels, carrying 393 guns, 10 transports, together of 10,000 tons burden, and 97 auxiliaries. The number of men to be provided for the navy and naval stations is given as follows:—4,919 marines, 571 guards for the arsenals, and 7,176 sailors—in all 12,661.

The beautiful screw steam yacht *Penelope*, built by A. Leslie & Co., of Newcastle, made her trial trip on the measured mile in the Thames, on 24th November last. Her average rate of speed was 12½ miles per hour. Her engines, built by Robert Morrison & Co., of Newcastle-on-Tyne, are upon the high pressure direct acting principle, with all the recent improvements. They worked most satisfactorily, making 150 revolutions per minute; pressure of steam, 50 lbs. per square inch on the boiler; nominal power, 20 horse; consumption of coals, 3 cwt. per hour.

The wreck register and chart for 1859, show that no fewer than 3977 shipwrecked persons were last year placed in imminent danger on our coasts; and that 1645 or nearly one half of that number perished, whilst the value of the lost property was more than a million and a half sterling. These dreadful statements is without anything like a parallel in former years. Can it not be mitigated? It is curious to note the extraordinary excess of wrecks in certain places. For instance, on the dangerous rock-bound and sand-embayed East Coast there were 621. When we remember, however, that England is the centre of the commercial world, that hither are attracted the mercantile navies of all nations as well as of our own; that last year alone the number of vessels which entered inwards and cleared outwards, including their repeated voyages from the different ports of Great Britain, was 300,580, representing a tonnage of 31,712,500, and probably having more than a million of people on board; that it is not an unfrequent occurrence to see 400 or 500 vessels at one time coming down the east coast, and equally as many at the mouth of the Thames and Mersey,—we say that when one considers all this enormous shipping and number of men which crowd, day after day, our narrow channels, skirted as they are by dangerous rocks, headlands, and sandbanks, it is not a matter of surprise that so many lamentable catastrophes should occur year after year among them. However, last year was one of the most disastrous on record to ships on our coasts, as many as 1416 wrecks having occurred, with the loss of, as we said before, 1645 poor creatures. The increase of these disasters is mainly to be traced to the very heavy storms of October 25 and 26, and of October 31, and November 1 and 2 last. In the former gale there were 133 total wrecks and 90 casualties resulting in serious damage, and 798 lives were lost. This number, however, includes the loss of 446 lives in the *Royal Charter*, which will always be remembered as one of the most melancholy shipwrecks that ever occurred on British shores. During the gale of November 1 and 2 there were 27 total wrecks and 27 casualties resulting in partial damage, and there was a loss of 51 lives. Besides these, 424 lives were lost at one time in the *Pomona* on the 28th of April, and 56 in the *Blervie Castle* on or about the 20th of December. Although the work of destruction, as thus officially recorded, is fearful to contemplate, yet it must be remembered that had it not been for the services of the lifeboats of the National Lifeboat Institution, the rocket and mortar apparatus of the Board of Trade, and other means, it would have been much more disastrous in its consequences. It is somewhat singular that while the number of casualties to British ships trading to, from, or between, places in the United Kingdom has greatly increased—viz., from 927 in 1858 to 1187 in 1859—the casualties to foreign ships similarly employed have decreased from 209 to 188. Out of every 175 voyages made by British ships employed in the oversea trade a casualty has happened, while in only one voyage out of 335 has a casualty happened to a foreign ship similarly employed. In the classification of the casualties according to the cargoes of the ships it appears that the ships which have suffered most are as follows,—viz., laden colliers, 506 in 1859 against 377 in 1858; light colliers, 71 against 41; ore ships, 130 against 101; and ships with passengers and a general cargo, 42 against 14. The vessels which have suffered most are schooners, 491; brigs, 292; sloops, 127; barques, 123; that the number of casualties to vessels between 100 and 300 tons is 493; between 50 and 100 tons, 455; and below 50 tons, 306; while the number to vessels from 300 to 1200 tons and upwards is only 160. Old age tells on ships as it does on human beings, and the ship that was once able to weather the fierce gale bends under the influence of advancing years and rotten timbers. The *Register* states that the greatest number of casualties have happened to ships between 14 and 20 years old, next between 20 and 30, and then to comparatively new ships, or ships between three and seven years of age. It also happens that 64 were upwards of 50 years old, three of this number being between 80 and 90, one between 90 and a 100, and one above 100 years old. From the force of the wind when each casualty happened, it appears that a marked increase has taken place in those which happened during force 11 (or "storm")—viz., 88 against 57 in 1858; and at force 12 (or "hurricane"), 87 against 11. There are altogether 158 lifeboats on the coast of the United Kingdom; about 100 of these are under the management of the National Life-boat Institution, and are manned and inspected in conformity with its regulations. They were manned last year, on occasion of service and of quarterly exercise by about 5000 persons. Let us hope to hear of yet a little more sympathy with this really humane society.

The screw steamer *Rangoon*, one of three steamers of 18,000 tons each, built by Messrs. Palmer, Brothers, & Co., of Jarrow, for laying the Rangoon and Penang cable, is now in the Thames taking the cable on board. Her engines are by Messrs. Robert Morrison & Co., of Newcastle, on the direct acting principle, with expansive valves and steam superheater. The nominal power is 250 horses; diameter of cylinders, 55 inches; length of stroke, 2 feet 9 inches. On her passage from the Tyne to the Thames she averaged 60 strokes per minute, and her consumption of coal was 20 cwt. per hour. The temperature of the steam in the superheater being 310 degrees, pressure of steam in the boilers 25 lbs., indicated horse power, 1000.

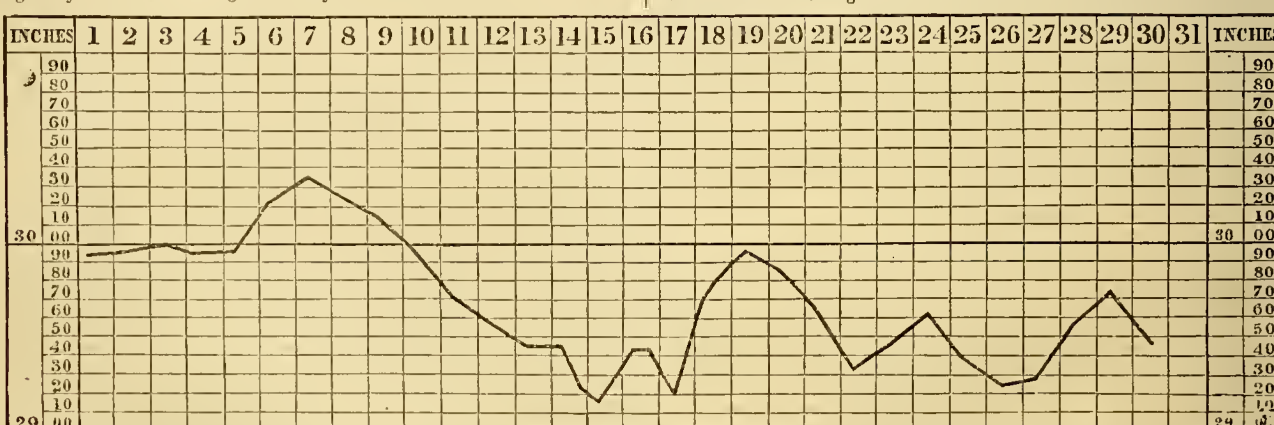
Scottish Collieries.—The number of collieries in operation for 1859 in Scotland was 216; their united product has been estimated at 5,700,000 tons, and the fatal accidents in and connected with these works during that period were 44, resulting in the loss of 47 lives—41 men and 6 boys. In explosions there were 8 accidents and 10 deaths; falls of coal and roof, 24 accidents, 25 deaths; from accidents in shafts, 10 deaths; and under the head miscellaneous, 2 deaths. The proportion of deaths per million tons of coal raised was 8·2. Though the loss of life from explosions of fire-damp show a slight decrease as compared with 1858, the number of accidents have not diminished in the same proportion. It is gratifying, however, to know that the charges for neglect of management have decreased, and that out of the 8 explosions of fire-damp, resulting in the loss of 10 persons, the Lord Advocate found it necessary to charge only in one case for neglect of duty.

various other kinds, and they contract largely with Government for the manufacture of all sorts of articles, from valves for steam engines to leggings for the army. Their manufactories are situated at West Ham, and the Old Kent Road, London, and they are sole agents to the new Company lately started for remanufacturing old and used rubber, a desideratum long wanted, but only lately obtained, and which promises to reward richly the inventor and his compeers.

Value of Barometrical Indications.—On the occasion of the hurricane which swept the island of St. Kilda, in the Hebrides, on the 3d October last, and inflicted such distressing loss on its poor inhabitants, the following were the indications of a "Kew Verified Barometer," on board her Majesty's Steamer *Porcupine*, then off the island as reported by her commander, Captain Otter, R.N. The rapid and regular fall of the mercury to the extent of 1½ inch between 8 a.m. on the 2d October, and 3.26 a.m. on the 3d, at which latter time the hurricane began, and its then rapid rise of nearly an inch, are interesting verifications of the certainty by which coming weather is indicated by this valuable instrument, which is at this moment deservedly attracting so much public attention.

			Inches.		
Oct. 2 ...	8·0 a.m.	mercury	30·32		
	8.0 p.m.	"	20.75		
	8.15 p.m.	"	29.70	wind S.	
	8.45 p.m.	"	29.62	SSW.	
	10.30 p.m.	"	29.34	SSW.	
	11.0 p.m.	"	29.26	SW.	
	11.45 p.m.	"	29.22	"	
Oct. 3 ...	0.15 a.m.	"	29.16	"	heavy squalls.
	0.45 a.m.	"	29.10	"	"
	2.0 a.m.	"	28.96	"	"
	2 40 a.m.	"	28.87	"	nearly calm.
	3.20 a.m.	"	28.87	"	westerly.
	3.26			NW, hurricane began.	
	5.30 a.m.	"	29.52	N, NNW, gale.	
	6.10 a.m.	"	29.65	NNW.	
	7.15 a.m.	"	29.55	N, nearly calm.	
	Noon.	"	29.87	NW by N.	
	2.30 p.m.	"	29.87		

The accompanying diagram represents the barometrical range for the month of November last. The vertical columns indicate the days of the month, and the horizontal lines the range of the mercurial column divided into 10ths of an inch.



Colours Derived from Aniline.—We have drawn attention, on former occasions, to the modern production of beautiful colours from peculiar sources, such as coal, tar, and grass. To an English chemist, Mr. Perkin, is now fully attributed the happy idea of endeavouring to ascertain whether there might not be found among the various beautifully coloured phenomena so well known in chemistry any that could be applied to the arts. In April, 1858, he showed his success by patenting a beautiful purple dye, named indisine, obtained by oxydising aniline by a dilute acid and bichromate of potash. In 1859, M. Verguin, of Lyons, also obtained a red dye by acting on aniline with the bichloruret of tin. Since then, M. Gerber, of Muhlhausen, by nitrate of mercury, has obtained another red, named azaleine; and MM. Depouilly, by employing nitric acid, have obtained a violet. The details of all the processes lead to the conclusion that a red or violet matter is obtained in proportion as the aniline is deficient or in excess in the mixture.

Vulcanised India-Rubber Machine Bands.—Users of power are well aware that one of the greatest difficulties they have to contend against in connection with its use, is the hitherto imperfect methods of conveying it. If it is transmitted by means of gear the consequence is a great loss of power through the necessarily immense friction, while if conveyed by the more ordinary means of leather bands, the slipping of which is sometimes so immense that it needs to be known by experience to be believed, the loss is even greater. Many kinds of bands, looking and promising well have been made of gutta percha, hemp, wire gauze, and other materials too numerous to mention, but all in the end have failed to supply the desired object. We have however this week seen bands at Messrs. Dedge and Giandonati's of St. Paul's Church Yard, and elsewhere, which not only promise, but have been fairly proved to be, the desideratum above referred to. These bands have now been in the market some six years, and in that time have been thoroughly tested and approved of, so much so that they are now generally adopted by the principal employers of power throughout the kingdom, and their sale is really enormous. Messrs. Dodge and Giandonati are also extensive manufacturers of rubber goods of

Admiral Cator recently reported to the National Life Boat Institution, that while at Cullercoats, near Shields, in the beginning of October last, the fishermen of that place had expressed to him their gratitude for the barometer which the Duke of Northumberland, president of the Institution, had presented to them. A fearful gale from the westward had about that time somewhat suddenly sprung up. The fishermen were preparing to go to sea. Some of them observed the fall of the barometer, while others disputed its utility and value, and even treated it with derision. The majority of the fishermen, however, decided that they would not go to sea while the barometer was falling, although it was quite fair at the time. A few hours afterwards, a terrific gale of wind came on from the westward, when they expressed their firm conviction that every one of them would, if they had gone to sea, as most assuredly they would have gone in the absence of the barometer, have perished by being blown far into the ocean and there overwhelmed. The diagram annexed is for the month of November just passed. The accompanying one inch diagram by Mr. James Glaisher, F.R.S., is an illustration of the two inch diagram which will be placed by the side of the barometers of the National Life Boat Institution on various parts of the coast of the United Kingdom. An inspection will show that till the 5th day, the deviations from a horizontal line are very small. Then there is an ascending line to the 7th, when the highest point in the month is reached; from this time, the 12th, the barometer reading was constantly decreasing; on the 13th there was scarcely any change; on the 14th two points are laid down as the reading, decreasing from 29·46 inches in the morning, to 29·28 inches in the evening; on the 15th the lowest reading in the month took place; on the 16th the reading was steady all day; it then decreased during the night to 29·30 inches. On the following morning there was a rise of half an inch between the 17th and 18th, and the increase continued till the 19th; there was then a decrease to the 21st; and alternately an increase and decrease about the point 29·5 inches till the end of the month. Now, if, day by day such curves be laid down, and be watched in connection with the direction of the wind and the barometer instructions by Admiral Fitzroy, F.R.S., they will certainly tend to save many lives, and to preserve much valuable property from destruction. We may add that the gallant Admiral, as well as Mr. Glaisher, F.R.S., are cordially co-operating with the Royal National Life Boat Institution in the establishment of thoroughly efficient barometers on the coasts.

Gold in Victoria.—From 1851 to 1859 inclusive, the gross produce of the gold fields of Victoria is set down at £87,045,000; and the annual returns show that while the yield has undergone a gradual diminution since 1856, there has been an increase in the number of persons engaged in mining pursuits, and in the number of quartz-crushing machines and steam-engines employed in extracting the precious metal, or in facilitating the operations of the miner. In March, 1857, there were 62,211 European males, of whom 3035 were quartz miners, and the mechanical appliances employed consisted of 359 quartz-crushing machines, and steam-engines, 3540 puddling machines, and 370 whims. In December, 1859, the number of miners had risen to 100,591, of whom 15,342 were at work upon quartz reefs; and the machinery employed was thus classified:—301 quartz-crushing machines; 296 engines, whose aggregate horse-power was 4357½; 3982 puddling machines; and 465 whims, of the total value of £1,155,923. The estimated value of the gold produced last year was £9,122,702; and deducting from this amount £231,184, representing 10 per cent. interest upon the capital invested in machinery, and 10 per cent. for its deterioration, it will give a net residue of £8,891,528, divisible among 100,591 miners, yielding to each individual an income of not more than £88 7s. 10d., or 34s. per week.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded October 4.

2402. John A. Knight, Symond's Inn, Chancery Lane—A new or improved mode of inflating air-mattresses and air-cushions.—(Communication from John Mellier St. Chamond (Loire), France.)

Recorded October 8.

2430. Samuel Whitaker, Liverpool, Lancashire—Improvements in the construction of fluid taps or cocks.

2431. George H. Underwood, Manchester, Lancashire—Improvements in finishing and stiffening textile fabrics.

2432. Edward J. Hughes, Manchester, Lancashire—Improvements in the preparation of certain colouring matters, and also a process of printing and dyeing woven fabrics, yarns, and other substances.—(Communication from Paul Depoully, Ernest Depoully, and Charles Lauth, Clichy, France.)

2433. John A. Knight, Symond's Inn, Chancery Lane—An improved lathe for ribbon looms.—(Communication from Etienne Colonnier-Peyron, St. Etienne, Loire, France.)

2434. Henry Bright, Sandwich Street, Barton Crescent—An improved guard or cutwater for ships or vessels, for the purpose of lessening or preventing injurious effects resulting from collision.

2435. William E. Newton, Chancery Lane—Certain improvements in springs for railroad cars, locomotives, and carriages.—(Communication from John E. Jerrold, John E. Beggs, and Francis Scott, Paterson, Passaic County, New Jersey, U. S.)

2436. William E. Newton, Chancery Lane—Improvements in the treatment of ores and coal.—(Communication from Charles K. Landis, Philadelphia, Pennsylvania, U.S.)

2437. Louis J. O. Jolly, Boulevard St. Martin, Paris—Improvements in the means of winding up and setting watches.—(Communication from Felix Berthet, Besançon, France.)

2438. Joseph Calkin, Oakley Square, Mornington Crescent—An improved apparatus for protecting the upper portion of the face from the inclemency of the weather, dust, or otherwise.

2439. William Clark, Chancery Lane—Improvements in cleaning or separating gutta-percha from extraneous matters, and in apparatus for the same.—(Communication from Louis B. A. Sarazin and Louis Hamy, Calais, France.)

2440. William Clark, Chancery Lane—Improvements in driving straps and belts—(Communication from Louis Boulet, Auguste Sarazin, and Louis Hamy, Calais, France.)

2441. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in railways or tramways, and in carriage wheels to be used thereon.—(Communication from William Wharton, jun., Philadelphia, Pennsylvania, U. S.)

2442. Edward Gardner, Maidstone, Kent—Improvements in machinery or apparatus employed in the manufacture of paper.

2443. Walter Hood, Glasgow, Lanarkshire—Improvements in ladies' trousers, drawers, or other underclothing.

Recorded October 9.

2444. William Snell, Clement's Inn, Strand—An improved machine for making horse-shoe nails.—(Communication from Amos Whittemore, Cambridgeport, Middlesex, Massachusetts, U.S.)

2445. Jonathan Edge, Tipping Iron Works, Bolton-le-Moors, Lancashire—Certain improvements in steam engines.

2446. Edward Worthington, Manchester, and Robert Mills, Rochdale, Lancashire—Improvements in apparatus for preventing the retrogression of railway carriages on inclines.

2447. George Price, Wolverhampton, Staffordshire—An improvement in the manufacture or construction of metallic armour for vessels of war, land defences, shields for ordnance, mantelets, &c.

2448. Charles Stevens, Welbeck Street, Cavendish Square—Improvements in atmospheric railways.—(Communication from V. C. Simboiselle, Rue Laffite, Paris, France.)

2449. George Price, Wolverhampton, Staffordshire—An improvement in metallic targets.

2450. George W. Reynolds, and Enoch Dance, Birmingham, Warwickshire—New or improved machinery for the manufacture of baskets and wicker work.

2451. Robert Anderson, Liverpool, Lancashire—Improvements in apparatus for economising and regulating the flow and passage of fluids for flushing water-closets.

2452. George Reid, Liverpool, Lancashire—Improvements in ventilating houses, buildings, ships, and structures generally, and in apparatus for ascertaining the state of the atmosphere in the said houses, buildings, ships, and structures.

2453. Richard Hands, and Richard M. Hands, Coventry, Warwickshire—Improvements in lustering, stretching, and finishing silks, and other yarns or threads.—(Communication from Simon Fontrobert, Paris, France.)

2454. James Chandler, Creek Road, Deptford, Kent—Improvements in glass gauges for indicating the levels of liquids, contained in vessels of any kind.

2455. Joseph Stockley, Newcastle-on-Tyne, Northumberland—Improvements in apparatus for grinding, smoothening, and polishing plate glass.

2456. Joel H. Tatum, Peele's Hotel, Fleet Street—Improvements in the manufacture of candlewick.

2457. Gaetano Bonelli, Milan, Sardinia—Improvements in electric conductors, and apparatus for transmitting telegraphic despatches.

2458. Francis Danby, Exmouth, Devonshire—An improved anchor.

2459. Arthur Grainger, High Holborn—A better and cheaper kind of embossing press, for embossing or stamping paper, linen, and other articles.

Recorded October 10.

2460. John Ramsbottom, Crewe, Cheshire—An improved mode of lubricating the pistons and valves of steam engines and other machines actuated by steam.

2461. Thomas Barnett, Beverley, Yorkshire—Improvements in machinery for drying grain, roots, and seeds, and for roasting coffee, cocoa, chicory, malt, and other vegetable substances.

2462. Charles Wheatstone, Hammersmith—Improvements in electro-magnetic telegraphs and apparatus for transmitting signs or indications to distant places by means of electricity, and in the means of and apparatus for establishing electric telegraphic communication between distant places.

2463. Aaron Hobson, and James Hobson, Wirtemberg Street, Clapham, Surrey—An atmospheric trap for the prevention of smells arising from cesspools, drains, water closets, urinals, or any other place where smell may arise.

2464. William Clark, Chancery Lane—Improved signalling and indicating apparatus.—(Communication from Jean Barissa, Boulevart St. Martin, Paris, France.)

2465. Desmond G. F. Gerald, Cambridge Street—Improvements in breech-loading fire-arms.

2466. John Scott, Sunderland, Durham—An improvement in the manufacture of anchors, and an improved apparatus to be employed therein.

2467. Arthur Maxfield, Nottingham, Nottinghamshire—Improvements in the construction of water-closets and urinals, together with flushing apparatus connected therewith, which said flushing apparatus is also applicable to the watering of gardens, the cleansing of windows, or for other purposes.

2468. Richard Hornsley, junior, Spittlegate Iron Works, Grantham, Lincolnshire—Improvements in machinery used for washing, wringing, mangling and churning.

2469. George T. Bousefield, Loughborough Park, Brixton, Surrey—An eraser and pencil sharpener.—(Communication from J. J. Greenough, Wall Street, New York, U.S.)

2470. George F. Stidolph, and John Stidolph, Ipswich—Improvements in organs.

2471. Timothy Whitby, Millbank Street, Westminster, and William Dempsey, Great George Street, Westminster—Improvements in applying springs to railway trucks, and to railway and other carriages.

Recorded October 11.

2472. Charles Stevens, Welbeck Street, Cavendish Square—An improved crinoline protector, or double petticoat.—(Communication from Clément Duplomb, père, Jean M. Duplomb, fils, and Louis F. Levrien, Rue Laffite, Paris, France.)

2473. Frederick, C. Bakewell, Haverstock Terrace, Hampstead—Improvements in furnaces.—(Communication from Jacob Reese, Pittsburgh, U.S.)

2474. William M. Williams, Handsworth, Staffordshire—An improvement or improvements in crayons, for writing, drawing, and marking.

2475. John Sylvester, West Broomwich, Staffordshire—A new or improved steam pressure and vacuum gauge.

2476. Thomas Wilson, Birmingham, Warwickshire—Improvements in paper files or holders.

2477. Jasper Smith, Abbey Street, Bethnal Green, and Thomas Taylor, Wellington Row, Bethnal Green—Improvements in the manufacture of chenile, and in machinery for that purpose.

2478. William Barker, Cornbrook, Manchester, Lancashire—Certain improvements in steam engines.

2479. Etienne J. Hanon, Paris, France—Improvements in the manufacture of vegetable albumine.

2480. Louis H. Rossean, Boulevart St. Martin, Paris, France—Certain improvements in steam engines.

2481. John Coleman, junior, Woburn, Bedfordshire—Improved apparatus for raising and stacking straw and other agricultural products.

2482. Jasper W. Rogers, Peat House, Robert's Town, Kildare—Improved means of, and apparatus for collecting the excrement of towns and villages, and for facilitating the drainage of houses.

Recorded October 12.

2483. John A. West, St. Helen's, Lancashire—Improvements in treating solutions containing sulphate of soda, also metallic and other matters, and in obtaining products therefrom.

2484. Richard A. Brooman, Fleet Street—Improvements in machinery for cutting and packing cigars.—(Communication from Julius De Bary, Offenbach, Hesse Darmstadt.)

2485. William E. Newton, Chancery Lane—Improvements in the manufacture of furniture nails, or tacks, and other articles provided with metallic pins or points—(Communication from Jean F. Bapteroses, Paris, France.)

2486. William E. Newton, Chancery Lane—An improved fastening for window shutters and blinds.—(Communication from Augustus Reeve, Allowaystown, Salem County, New Jersey, U.S.)

2487. Jasper W. Rogers, Peat House, Robert's Town, Kildare—Improvements in the mode of, and apparatus for, preparing peat for fuel.

2488. Thomas Wilson, Birmingham, Warwickshire—Improvements in breech-loading fire-arms, ordnance, and projectiles.

2489. Benjamin Rhodes and George Rhodes, Nottingham, Nottinghamshire—Improvements in machinery and in apparatus connected therewith for the manufacture of bituminous pipes, and other articles.

Recorded October 13.

2490. John Blackwood and William Blackwood, Craigton, Dumbartonshire—Improvements in apparatus for washing yarns or threads.

2492. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in the production of colours for dyeing and printing.—Communication from Louis J. Troost, Paris, France.)

2493. George Wereing, West Broomwich, Staffordshire—Certain improvements in the manufacture of saucepans formed of cast iron, and which said improvements are also applicable to the manufacture of general cast iron hollow ware.

2494. Samuel Reston, Liverpool, Lancashire—An improved rotatory engine.
2495. William Clark, Chancery Lane—Improvements in lubricating apparatus.—(Communication from Napoléoo Jourdan, Paris, France.
2496. Richard A. Brooman, Fleet Street—Improvements io lenses.—(Communication from Charles C. Harrison, New York, U.S.
2497. Martin Deavin, Crystal Terrace, Rotherhithe, New Road Surrey—An improvement in gymnastic apparatuses known as see-saws, and an improved mode of working the same.
2498. Horace W. Harding, Regent Street—An improved combined sandwich-case and drinking flask.
2499. John J. Russell and Burdett L. Brown, Wednesbury, Staffordshire—Improvements in apparatus used for supplying steam from steam boilers or generators.
2500. Thomas C. Hayward, the younger, Highbury Park, North—Improved ship's signals for day and night.
2501. James Higgins and Thomas S. Whitworth, Salford, Lancashire—Improvements in machinery or apparatus for preparing, spinoing, and doubling cotton, and other fibrous materials.

Recorded October 15.

2502. Weston Grimshaw, Wharton Lodge, Lytham, Laocashire—Certaio improvements in apparatus for superheating steam in locomotive steam engines.
2503. George Davis, Scarle Street, Lincoln's Inn, and St. Enoch Square, Glasgow—An improved method of, and apparatus for, refrigerating and freezing.—Communication from Perdinand P. E. Carré, Paris, France.)
2504. Joseph T. Webster, Mansfield, Nottingham — An improvement in driving the spindles of doubliog frames.
2505. Cable Brennand and John Brennand, Manchester, Lancashire—Improvements in ornamenting lappets, petticoats, window curtains, blinds, and similar articles.
2506. Samuel Roberts, Hull, Yorkshire—Improvements in steam engines.
2507. Charles Stevens, Welbeck Street, Cavendish Square—An improved machine for cutting out bricks and drain pipes.—(Communication from Louis C. Desaiot, Rue Laffitc, Paris, France.)
2509. Isaac M. Singer, New York, U.S.—Improvements in the construction and fitting of steam vessels.
2510. Alexander M'Dougall, Manchester, Lancashire—Improvements in materials or compositions for destroying vermin on sheep and other aoimals, and for protecting them therefrom.
2511. William E. Newton, Chancery Lane—Improvements in tools or machines for the manufacture of certain kinds of metallic tubes.—(Communication from Felix Richard, Paris, France.)
2512. Charles Burn, Delahay Street, Westminster—Improvemeots in tramrails for street railways.
2513. Charles Buro, Delahay Street—Improvemeots in the permanent way of street railways.

Recorded October 16.

2515. Joseph Bent, Newhall Street, Birmingham, Warwickshire, and Joseph Luckock, Harborne, Staffordshire—Certain improvements in ladies' clasps, and which said improvements are also applicable for connecting or holding waistbands, belts, and other articles of dress.
2516. John Bergen, Long Lane, West Smithfield—Improvements in chimney pots.
2517. Charles J. Burnett, Ainslie Place, Edinburgh—Improvements in breech or muzzle loading ordnance.
2518. Richard Roberts, and Thomas E. Symonds, Adam Street, Adelphia—Improvements in marine steam engines, and in machinery and apparatus connected therewith.
2519. William E. Newton, Chancery Lane—An improved mode of constructing railways.—(Communication from Alexander Hay, Philadelphia, U.S.)
2520. John L. Jullion, Tyoemouth Northumberland—An improvement in the manufacture of paper.
2521. John L. Jullion, Tynemouth, Northumberland—Improved machinery for making fences.—(Communication from Archibald Kelly, Pittsburg, Pennsylvania, U.S.)
2522. Sidney Fraukau, Bishopsgate Street Within—Improvemeuts in plugs for smoking pipes.

Recorded October 17.

2523. Francis Xavier Kukla, Pentonville Road—Improvements io apparatus for heating stoves by gas.
2524. William Ramsell, Evelyn Street, Deptford, Kent—Improvements in the manufacture of boiler plates, also applicable generally for the resistance of steam or interoal pressure, and in the apparatus or machinery employed therein.
2525. William Henderson, Alderley Edge, and Jonathan Down, Alderley, Cheshire—Improvements in obtaining copper, silver, tin, and several other metals, from their ores or any other natural or artificial compouod containing one or more of these metals.
2526. Joseph Risdale, Minories—Improvements in apparatuses for signalling, particularly applicable to marine engine room telegraphs.
2527. James P. Budd, Ystalyfera Iron Works, Swansea—Improvements in the manufacture of terne plates.
2528. William Clarke, and Samuel Butler, Nottingham—Improvements in the manufacture of fabrics in twist lace machinery.
2529. William E. Newton, Chancery Lane—An improved mode of preserving hops, and fitting them for storage and transportation —(Communication from James C. Baldwin, Waterville, Robert Brayton, Buffalo, New York, U.S., anu M. D. Baldwin, Brantford, Canada.)
2530. Alfred V. Newton, Chancery Lane—Improvements in lamps.—(Communication from Francis B. De Keravenan, New York, U.S.)
2531. Daniel A. Leyshon, Brockmoor, Brierly Hill, Staffordshire—An improvement or improvements in coating certain forms or articles of iron, steel, or zinc.
2532. Henry A. F. Duckham, Terthewey Lodge, Junction Road, Holloway—Improvements in gas meters and regulators.
2533. William Sear, Wolverton, Buckinghamshire—Improvements io cartridges.
2534. Robert G. M'Crum, Milford, Armagh, Ireland—Improvements in machinery or apparatus for preparing 'cards' for jacquard machines.
2535. Gavin Young, Glasgow, Lanarkshire—An improved hemming and bioding gauge for sewing machines.
2536. William Eades, and George Worstenholm, Birmingham, Warwickshire—Certaio improvements in screw stocks and dies for cutting or forming metal screws.

Recorded October 18.

2537. Archibald Whyte, Great Missenden, Buckingham—An apparatus for drying hay, corn, and roots and other things.
2538. Thomas J. Marshall, Bishopsgate Street Without—Improvements in the manufacture of paper, and in machinery or apparatus for effecting the same.
2539. Alfred B. Jacout, Rheims, France—Improvements in water meters.
2540. Alexandre Debain, Place Lafayette, Paris—A new or improved sounding apparatus applicable to all musical instruments having key-boards.
2541. Edward Habel, Jonas Holzwasser, and Edward Burns, Manchester, Lancashire—Certain improvements in steam engines.
2542. Henry Williams, Weston-super-Mare, Somerset—Improvemeots in the manufacture of boots.
2543. Alfred V. Newton, Chancery Lane—Improvements in the construction of passenger carriages.—(Communication from Thomas Castor, Philadelphia, U.S.)
2544. Alfred V. Newton, Chancery Lane—Improved machinery for crushing quartz aod other substances.—(Communication from Peter Hannay, Washington, U.S.)
2545. John L. Jullion, Tynemouth, Northumberland—Improvements in paper making machinery.—(Communication from John Hoyt, Cleveland, Ohio, U.S.)
2546. Maurice Wesolowski, Cincinnati, Ohio, U.S.—Improvements in the obtaining of light, and in the apparatus employed therein.—(Communicatioo from Johann N. Reithoffer, Vienna.)
2547. John Macintosh, North Bank, Regent's Park—Improvements in apparatus for compressing air, and in raising and forcing water and other fluids.
2548. William Andrews, Woburn Chambers, Henrietta Street, Straod, aod Threadneedle Street—Improvements in insulators for telegraph wires.
2549. Gerrge B. Bruce, and Andrew Stein, Great George Street, Westminster—Improvements in rail aod tramways.

Recorded October 19.

2551. Joseph A. Munn, East Street, Red Lion Square, W.C.—A metallic thermometer.—(Communication from J. B. Hubbard, New York, U.S.)
2552. John Thomson, Edward G. Fitton, and Frederick A. Fitton, Manchester—Improvements in machinery used in boring, turning, and cutting metals and other substances, part of which is applicable for driving other machinery.
2553. James Jack, and David Rollo, Liverpool, Lancashire—Improvements in the construction of surface condensers and feed water heaters, and in the combination of certain parts of steam engines, especially adapted for marine purposes.
2554. James Marsden, Turnmill Street, Clerkenwell—An improved method of bleaching and whitening fibres and fabrics of various kinds.
2555. Charles Hoare, Allington, Dorsetshire—Improvements in machinery for twisting and laying flax, hemp, and other fibrous materials.
2556. Thomas Moy, Clifford's Inn, and Frederick B. Wardroper, Warwick Square, Pimlico—Improvements in the construction of vessels for river navigation.
2557. Andrew G. Hunter, Dean Street, Newcastle-upon-Tyne—Improvements in treating sulphurets.
2558. Joseph Burch, Crag, near Macclesfield, Cheshire—Improvements in the construction of boilers for geueratiog steam, and other heating purposes.

Recorded October 20.

2559. William Yonng, Tavistock Place, Tavistock Square—Improvements in ship-building.
2560. James Ash, Blackwall—Improvements in the construction of iron ships.
2561. William Jamieson, Ashton-under-Lyne, Lancashire, William Robinson, aod Cordingley Rowbottom, Glossop, Derby—An improvement or improvements in apparatus for grinding or sharpening the cards used in carding fibrous materials.
2562. Weston Grimshaw, Warton Lodge, Lytham, Lancashire — Improvements in machinery or apparatus for drying, mixing, aud pulverising clay and other materials.
2563. Rigby D. Smith, and James Smith, London Wall—Improvements in the mannfacture of leggings or knickerbockers.
2564. Paul Margetson, New Weston Street, Bermondsey—Improvements in boots.
2565. Auguste C. A. Bertrand, Chesnut Terrace, Grange Road, Bermoudsey, Surrey—Improvements in the manufacture of matches and cigar-lights.
2566. Ebenezer W. Hughes, Parliament Street—Improvements in the construction of tents particularly adapted to military purposes, part of which invention is equally applicable to temporary buildings geuerally.
2567. William Clark, Chancery Lane—Improvements in the manufacture of articles of jewellery, and in apparatus for the same.—(Communicatiou from Messrs. Jean L. A. M. Bouret, and Charles T. Ferre, Paris.)

Recorded October 22.

2568. John Smith, Manchester, and John Holt, Farnworth, near Bolton-le-Moors, Lancashire—Improvemeuts in machinery for preparing and spinning cotton and other fibrous materials.
2569. John Farmer, and James L. Fuggle—Improvements in the manufacture of scarfs cravats, and similar articles.
2570. Charles G. Russell, Manchester, Lancashire—An improved method of, and apparatus for, facilitating the operation of certain kinds of printing from engraved plates, cylinders, lithographic stones, letter press blocks, and other like surfaces.
2571. Richard A. Brooman, Fleet Street—Improvements in apparatuses for evaporating and concentrating, specially applicable to the manufacture of sugar.—Communication from Jean Baptiste. Dureau, Arras, France.
2573. Andrew Dietz, New York, U.S.—An improved process or method for tanniog skins, hides, &c., and converting them into leather.
2574. Joseph Wadsworth, Marple, Cheshire, and James Wadsworth, Salford, Lancashire.—Improvements in gas burners, and improved modes of manufacturiug the same.
2575. William E. Gedge, Wellington Street, Strand—Improvements in feeding steam boilers.—(Communication from Charles Delcourt, Pierre Boulicault, Dijoo, and Claude Maupoil, Cormot Côté d'Or, France.)
2576. George W. Hart, Stanley Terrace, Southsea, Portsea, Hants—Improvements in the construction of vessels of war, and in propellors for the same.
2577. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements io apparatus for measuring the flow of liquids, partly applicable to ordinary water cisteros.—(Communication from Augustine M. Herland, Paris.)

Recorded October 23.

2578. William H. Tylor, Warwick Lane, Newgate Street—Improvements in apparatus for heating and aerating saline or other liquids for baths, and in the salinometers employed in connection therewith, parts of which improvements are applicable to other purposes.
2579. William H. Clark, and John De la Mare, Jersey—An improved lubricating composition to be used with other lubricators.
2580. Edwin Lewis, Birmingham, Warwickshire—An improved apparatus for washing, cleaning, or separating particles of metal from other refuse matter.
2581. Edward B. Wilson, Parliament Street, Westminster—Improvements iu wheels for railway purposes.
2582. Robert Baynes, Downshire Hill, Hampstead—Improvements in lawn mowing machines.
2583. John Webber, jun , Trentham Terrace, Grove Road, Mile End — An improved mode of, and apparatus for, converting rope into oakum.
2584. Charles Lungley, Deptford, Kent—Improvements in the construction of iron ships and other vessels, for the purpose of rendering them unsinkable and increasing their strength.

2585. George Beazley, Highbury Park, South Islington—A new mode of preparing dyes produced from analine.
2586. Thomas W. Headlam, Montague Villas, Tottenham—Improvements in stuffing chairs, couches, matresses, pillows, and other such like purposes, especially adapted also for stuffing cabin furniture, and the seats and backs of public and private vehicles.

Recorded October 24.

2587. William H. Walenn, Talbot Road, Camden Road, Holloway, Islington—Improvements in magneto-electric machines, and in electro-magnetic engines.
2588. Guillaume Lacaire, Creton, Gironde, France—An improved pen-holder.
2589. James Kenyon, Adlington, Lancashire — Certain improvements in looms for weaving.
2590. Edward K. Dutton, Stretford, Lancashire—Certain improvements in machinery or apparatus for singeing textile goods or fabrics.
2591. David Allison, and Jeremiah Kay, Manchester, Lancashire—Improvements in window frames and sashes.
2592. James Taylor, Castle Iron Works, Staleybridge, Cheshire, Horatio N. Gartside, and John H. Wood, Horset Mill, near Delph, Saddleworth, Yorkshire—Improvements in self-acting mules for spinning and doubling.
2593. William R. Taylor, Paradise House, Oxford—Improvements in rifle belts.
2594. John M'Innes, Glasgow, Lanarkshire—Improvements in machinery, apparatus, or means for actuating or working railway breaks.
2595. William Eddington, junr., Chelmsford, Essex—Improvements in machinery for draining, ploughing, and cultivating land.
2596. Thomas Garnett, Low Moor, near Clitheroe, Lancashire—Certain improvements in looms for weaving.
2597. John Chisholm, George Chisholm, and Thomas Kent, Mark Lane—An improved method of obtaining compounds of nitrogen.

Recorded October 25.

2599. Edgar Breffit, King William Street—Improvements in the mode of packing bottles.
2600. William Prosser, Dorset Place, Dorset Square, and Henry J. Standly, Pall Mall East, Westminster—Improvements in apparatus employed in the production of light.
2601. John Richards, Tipton, Staffordshire—A new or improved break for arresting or stopping carriages or trucks on inclines, when by the breaking of coupling, links or other accident the said carriages or trucks are in danger of running down the said inclines.
2602. John Kay, John Hartley, Burnley, Lancashire, and Thomas Mallinson, Manchester, Lancashire—Certain improvements in 'self-acting mules' for spinning cotton and other fibrous substances.
2603. William Mann, Barnsbury—Improvements in apparatuses for washing and condensing gas.
2604. Richard A. Brooman, Fleet Street—Improvements in apparatuses for raising liquids.—(Communication from Jacques Taillandier, Paris, Francois Raynaud, Moulins, and Jean Jan, France.
2605. Henry Cook, Cheetham Hill, Manchester, Lancashire—An improvement in the manufacture of crinoline.
2606. William C. Cambridge, Bristol—Improvements in the construction of harrows.
2607. William Hodson, Kingston Square, Kingston-upon-Hull—Improvements in fire baskets or moveable grates and ovens.

Recorded October 26.

2608. Frederick S. Barff, Dublin—Improvements in the production of artificial stone which improvements are also applicable to the preservation of stone, bricks tiles, and other analogous substances or materials.
2609. Frederick S. Barff, Dublin—An improved self-acting apparatus for extinguishing candles in lamps or otherwise.
2610. William Sharpe, Swadlincote, Derby—Improvements in latches and locks.
2611 Horace Boys, Downs, Northfleet, Kent—Improvements in preparing the bine and leaves of the hop plant.
2612. Thomas Cobley, Meerholz, Hesse, Germany—Improvements in the manufacture of white lead (meaning carbonates of lead).
2613 Henry S. Anmonier, and Charles J. Wellard, Saint John Street, Clerkenwell—Improvements in facilitating the division of sheets or pieces of paper, or other substances, into required forms, and in the means or apparatus employed for the purpose.
2615. Charles F. Clark, Wolverhampton, Staffordshire—An improvement or improvements in enamelling or coating with glass certain kinds of metallic articles.
2616. Richard A. Brooman, Fleet Street—Improvements in uniting water, gas, and other pipes and tubes.—(Communication from Athalis Delaporte, Paris.)
2617. William Palmer, Grange Mills, Grange Road, Bermondsey, Surrey—Improvements in packing the pistons of cyliaders.
2618. William Syrett, Bury St. Edmunds, Suffolk—Improvements in steam engines.
2619. Elijah F. Prentiss, Liverpool, Lancashire—Improvements in cars or carriages to run on street railways or tramways.

Recorded October 27.

2620. Charles Hathaway, Liverpool, Lancashire—Improvements in the construction of street railways, and in the wheels to run thereon.
2621. Edward Sparkhall, Cheapside—An improvement in umbrellas and parasols.
2622. Henry Lawson, Holcomb Brook, near Bury, Lancashire—Improvements in machinery for putting cop tubes on to the spindles of mules for spinning, and in apparatus for supplying the cop tubes to the said machinery.
2623. Joseph Burch, Crag, near Macclesfield, Cheshire, and Edward Booth, Manchester, Lancashire—Certain improvements in extracting colouring matter from vegetable, animal, and other substances, and making decoctions and infusions therefrom.
2625. Walter Mabon, jun., and William P. Ganlton, 'Ashton Old Road Iron Works,' Manchester, Lancashire—Improvements in apparatus for heating the feed water for steam boilers by the exhaust steam from high pressure engines.
2626. Thomas Smedley, Holywell, Flint—Improvements in the manufacture of metal rollers and cylinders used for calico printing, and other purposes.
2627. Josiah Harris, Ess Hill House, Newton Abott, Devonshire—Moveable armour for protecting ships of war and batteries from the effects of shot and shell.
2628. William Hunt, Tipton, Staffordshire—Improvements in obtaining sulphur, or certain sulphur compounds from certain other sulphur compounds, and in obtaining carbonic acid.
2629. William Mann, City Gas Works, Whitefriars—A method of indicating at a distance the revolutions of shafts, spindles, and axles.
2630. Edmund K. Dwyer, Pimlico—Improvements in machinery for doubling, creasing, and folding cloth.
2631. Frederick H. Elliott, Strand—An improved case for aneroid barometers for marine purposes.
2632. John Ashby, Croydon, Surrey—Improvements in apparatus for cleaning grain before grinding, and in dressing the same after being ground.
2633. William Clark, Chancery Lane—Improvements in corsets and their fastenings, which are also applicable to other articles of dress.—(Communication from Alphonse Cousin, and Adele Duval, Boulevart St. Martin, Paris.)
2634. William E. Newton, Chancery Lane—Improved apparatus for milking cows.—(Communication from L. O. Colvin, Cincinnatus, Cortlandt, New York, U.S.)

Recorded October 29.

2635. Amherst, H. Renton, Cambridge Street, Eccleston Square, Pimlico—Improvements in apparatus employed in the production of light.
2636. Robert Blacklidge, Bolton-le-Moors, Lancashire—Improvements in the preparation of materials for sizeing, dressing, or finishing warps, yarns, textile fabrics, or paper.
2637. Nehemiah Brough, and George T. Kilby, Birmingham, Warwickshire—New or improved fastenings for articles of dress, and for fastening belts and hands generally.
2638. Thomas Wilson, Birmingham, Warwickshire—Improvements in moveable spanners or screw wrenches.
2639. John A. Knight, Symonds' Inn, Chancery Lane—A new system of photographic or dagueerean apparatus or objective, to be called 'Korn's polyograph.'—(Communication from Charles F. Korn, Boulevart Bonne Nouvelle, Paris.)
2640. Thomas Neal, Saint John Street, Smithfield—Improvements in grinding mills.
2641. Frederick H. Elliot, and Charles A. Elliot, Strand—An instrument for indicating the approach of vessels to shoals, rocks, and land.
2642. Edward Harrison, William Bradbury, James Buckley, and Dan Garside, Oldham, Lancashire—A certain compound, or certain compounds, to be used as a substitute for gunpowder.
2643. Thomas Greenwood, and Jacob Dockray, Leeds, Yorkshire—Improvements in machinery for carding, opening, and straightening tow and other fibrous substances.
2644. Alfred V. Newton, Chancery Lane—An improved washing machine.—(Communication from George M. Ramsay, New York, U.S.)
2645. William E. Newton, Chancery Lane—Improvements in looms.—(Communication from George M. Gibson, and Thomas A. Johnstone, Boston, Suffolk, Massachusetts, U.S.)
2647. Charles Crockford, Holywell, Flintshire—Improvements in the manufacture of spelter from the sulphuret of zinc.
2648. William Clark, Chancery Lane—Improvements in railway break apparatus.—(Communication from Antoine Grivel, jun., Boulevart St. Martin, Paris.)
2649. Michael Henry, Fleet Street—An improved method of manufacturing railway wheel tyres and other articles of steel.—(Communication from Pierre Sabatier, and Nicolas T. Deyeux, Boulevard Saint Martin, Paris.)

Recorded October 30.

2650. Isaac Dreyfus, Paris—Improvements in rolling iron and in machinery employed therein.
2651. William T. Vose, Massachusetts, U.S. — An improved pump or portable fire annihilator.
2652. John Beck, Isabella Street, Broadwall, Christchurch, Surrey—Improvements in stop valves for water, steam, or other fluids.
2653. David S. Miller, Marlborough Street, Calton, Glasgow, Lanarkshire—Improvements in weaving and in the apparatus used for that purpose.
2654. William E. Newton, Chancery Lane—Improvements in the production of alumina and salts of alumina.—(Communication from Louis Le Chatelier, Paris.)
2655. Alfred V. Newton, Chancery Lane—An improved mode of, and apparatus for, desiccating wet or moist substances.—(Communication from J. E. Tourne, New Orleans, Louisiana, U.S.)
2656. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in rotatory engines. — (Communication from Edward Schentz, Stockholm, Sweden.)
2657. James M. Henderson, Renfrew—Improvements in marine steam-engines.
2658. Thomas Tribe, Princess Square, Kennington, Surrey—Improvements in ship's berths, bedsteads, and sofas.

Recorded October 31.

2659. Antoine L. Cheradame, and Jean B. A. Lambert, South Street, Finsbury—A life-preserver.
2660. William Bull, Great George Street, Westminster—Improvements in the permanent way of railways and in connection therewith.
2662. Louis Martin, Tenison Street, York Road, Lambeth, Surrey, and Oliver Penfold, Blackmoor Street, Drury Lane—Improvements in the manufacture of candles.
2663. John C. Pearce, Bradford, Yorkshire—Improvements in steam engines and boilers.
2664. George Davies, Serle Street, Lincoln's Inn, and St. Enoch Square, Glasgow, Lanarkshire—Improvements in boxes for railway carriage axles, and other shafts.—(Communication from Isaac P. Wendell, Philadelphia, Pennsylvania, U.S.)
2665. George Davies, Serle Street, Lincoln's Inn, and St. Enoch Square, Glasgow, Lanarkshire—Improvements in the manufacture of boots, shoes, and other coverings for the feet, and in apparatus connected with such manufacture—(Communication from Alexandre J. Duchatel, Paris.)
2666. James Anderson, Belfast, Ireland, and Biliter Street—Improvements in the manufacture of felt, and in the mode of applying the same to railways and to other uses.

Recorded November 1.

2667. William Reynolds, Prior Cottage, and George A. Samson, Duck Lane, Edmonton—Improvements in the manufacture of boots and shoes.
2668. David Joy, Manchester, Lancashire—Improvements in the valves of steam hammers, which are also applicable to other purposes.
2669. Frederick Johnson, North Street, Westminster—Improvements in fixing screw piles and moorings.
2670. Mathias A. J. Dahmen, Peckham—Protecting ships and other vessels, buildings, works of construction, and other bodies.
2671. E. Freeman Prentiss, Philadelphia, U.S.—Improvements in the combination of chemical materials for scouring, bleaching, and dyeing wool, cotton, silk, and other materials.
2672. James Underhill, Loveday Street, Birmingham, Warwickshire—Improvements in window sash and casement fasteners.
2673. William Edwards, Manchester—A self-acting apparatus for regulating and adjusting the pressure of gas and other fluids.
2674. William E. Newton, Chancery Lane—An improved mode of preparing or insulating electric conductors for telegraphic purposes either on land or under water.—(Communication from Messrs. Claes, Van den Nest, and Co., Menin, Belgium.)
2675. Wilberforce Bryant, Lipson Terrace, Plymouth—Improvements in treating oily and fatty substances.

2676. Charles Harratt, Hornsey Lane, Highgate—Improvements in machinery used in giving motion to a shaft or axis used in propelling vessels, ploughs, and machinery.
2677. John Bettyes, Upper Gloucester Street—Improvements in carriages and carriage springs.
2678. Robert Murray, Sandhill, Newcastle-upon-Tyne—Improvements in the manufacture of telegraph cables or ropes.

Recorded November 2.

2680. Henry Davidson, Spray's Buildings, and James M. Ellercamp, Powis Street, Woolwich, Kent—Improved apparatus for lowering and disengaging ships' boats from their tackles, parts of said apparatus being applicable to the lowering and disengaging of other heavy bodies or merchandise.
2681. Henry Williamson, Coventry, Warwickshire—Improvements in silver watch cases.
2682. William Clark, Chancery Lane—Improvements in steam generators.—(Communication from Pierre F. Joly, Boulevart St. Martin, Paris.)
2683. Joseph J. O. Taylor, Mark Lane—An improvement in the separation of silex and silicious and other matters from steel.
2684. James Leonard, and Bernhard Lorentz, Skinner's Place, Size Lane—Improvements in the manufacture of ornamented woven fabrics when chenille is employed.
2685. George Hamilton, Royal Exchange—Improvements in locks.
2686. Malcolm Clark, and Archibald Clark, Glasgow, Lanarkshire—Improvements in packages or holders for containing biscuits.
2687. Richard A. Brooman, Fleet Street—Improvements in machinery for felting threads and other filamentous substances.—(Communication from Ferdinand R. Tavernier, Paris.
2688. William T. Denham, Wellington Square, Clerkenwell—Improvements in producing devices on velvet, paper, and other fabrics or materials.
2689. William E. Newton, Chancery Lane—An improvement in preparing compounds of India-rubber, gutta percha, and allied gums.—(Communication from Rudolph F. H. Havemann, New Brunswick, New Jersey, U.S.)

Recorded November 3.

2691. Jean H. M. V. Hinsbergh, Breda, Holland—Cleaning and preparing pork's wool, so as to give it the elasticity of horse hair and the flexibility of wool for bedding sofas, chairs, &c.
2692. George Roberts, Openshaw, near Manchester, Lancashire—Improvements in the construction of steam boilers, and in the flues connected therewith.
2693. William Durham, Loanhead, Mid-Lothian—Improvements in preparing materials for the manufacture of paper.
2694. John Armour, Kilmarnock—Improvement in dies employed in the manufacture of sewerage pipes, chimney linings, and other hollow bodies of clay.
2695. Samuel Webb, Thomas Timmins, and Robert Brough, Birmingham, Warwickshire—New or improved machinery for the manufacture of nails, spikes, and staples.
2696. William White, and Josiah Parlby, Great Marylebone Street—Improvements in colouring or obtaining the effect of colouring, and other ornamentations, to surfaces in relief, or partly in relief.
2697. George Shillibeer, City Road, and George Giles, Fenchurch Buildings—Improvements in the construction of omnibuses or other vehicles
2699. Thomas Wrigley, Bridge Hall Mills, near Bury, Lancashire—Improvements in apparatus for filtering water and other liquids.
2700. George Hinton, Oldbury, Worcester—Improvements in the manufacture of iron, steel-iron, and steel from certain waste products, and in the machinery or apparatus to be employed in such manufacture, which improvements are also applicable to the re-melting of large lumps of iron or steel.
2701. William Edwards, Birmingham, Warwickshire—Improvements in fire screens or guards.
2702. Peter Spence, Newton Heath, near Manchester, Lancashire—Improvements in separating copper from its ores.
2703. Joseph Mitchell, Keighley, Yorkshire—Improvements in the manufacture of cast iron pipes, tubes, rollers, and similar work.

Recorded November 5.

2704. Sir Peter Fairbairn, and Robert Newton, Leeds, Yorkshire—Improved machinery for heckling flax and hemp.
2705. William Langshaw, Egerton, near Bolton, Lancashire—Improvements in the means or method of polishing or finishing yarns or threads.
2706. George Davies, Serle Street, Lincoln's Inn, and St. Enoch Square, Glasgow, Lanarkshire—Improvements in travelling bags.—(Communication from Messrs. Keller & Co., Paris.)
2707. E. F. Prentiss, Philadelphia, U.S.—Improvements in the combination of chemical materials forming a mordant for dyeing wool and woollen goods.
2709. John Lancaster, Garden Farm, Dunmurry, Belfast—An improved mowing and reaping machine.
2710. John Ridley, Stagshaw, Northumberland—Improvements in reaping and mowing machines.
2711. James Webster, Birmingham, Warwickshire—Improvements in obtaining gas (mainly oxygen) for improving artificial light, and for other purposes, also for utilizing the products resulting from its manufacture.
2712. Benjamin Seed, Great Horton Lane, Bradford, Yorkshire — Improvements in apparatus used in the treatment of soap suds or other saponaceous or oily matters, which apparatus is also applicable in the treatment of other matters.

Recorded November 6.

2713. Montague R Leverson, Saint Helen's Place—Improvements in fire-arms.—(Communication from William H. Smith, Philadelphia, U.S.)
2714. William Green, New Bond Street—Improvements in fire-arms breech-loading.
2715. Edward P. H. Vaughan, Southampton Buildings, Chancery Lane—An improved plug for boats.
2716. John Froggatt, jun, Lenton, Nottingham—An improvement in apparatus for burning gas.
2717. William Hewit, Birmingham, Warwickshire—An improvement or improvements in whip holders or whip sockets.
2718. Thomas W. Rammell, Victoria Street, Westminster—Improvements in centrifugal discs revolving in air, water, and other fluids, and in the application of motive power by such discs.
2719. William Jones, High Holborn — Improvements in machines or presses, and apparatus attached thereto, for stamping or embossing paper or other substances.
2720 William Pearce, Poole, Dorset, and Edward Bowles, Little Camford—Improvements in apparatus for ploughing land,
2721. William Birks, elder, and William Birks, younger, Nottingham—Improvements in bobbin net, or twist lace machinery.
2722. Henry Thornton, Wardington, Oxon—Improvements in sheds for sheep.
2723. John B. Gytou, Grimsthorp, Lincoln.—Improvements in paddle wheels.
2725. Charles Asprey, New Bond Street, and Albemarle Street—An improvement in locks for bags, dressing cases, and other articles.
2726. Elias Howe, Oxford Street—Improvements in projectiles.—(Communication from John W. Cochran, New York, U S.)
2727. Richard A Brooman, Fleet Street—An improvement in the manufacture of forks and spoons.—(Communication from Adolphe J. Coque, and Alexandre F. Chavet, Paris.)
2728. James Higgins, and Thomas S. Whitworth, Salford, Lancashire—Improvements in machinery or apparatus for preparing cotton and other fibrous materials for spinning.
2729. Thomas W. Smith, Lower Road, Islington—An improved process for obtaining pigments.
2730. George Wilson, Yorkshire—An improved construction of stoppered bottle.
2731. Thomas Cobley, Meerholz, Hesse, Germany—Improvements in the method of treating poor ores of copper.

Recorded November 7.

2733 William Cook, Charing Cross—Improvements in ventilating.
2735 John Clark, Strand—Improvements in outside shop-lights.
2736 William K. Hydes, Liverpool, Lancashire—Improvements in steam engines and boilers, and in the mode or method of forming or shaping sheets or plates of metal for certain parts of the same.
2737. Joseph and Edmund Ratcliffe, Birmingham, Warwickshire—Certain improvements in lamps for lighting vestibules, halls, or other like places.
2738. Robert Dressel, and Ferdinand Levestamm, New Oxford Street—Improvements in stoves.
2739. John Church, Boxworth, Cambridge—A brick and tile machine.
2740. Richard A Brooman, Fleet Street—Improvements in liquid and fluid meters.—(Communication from Louis C. Uhler, Paris.)
2741. Samuel Fox, Deepcar, near Sheffield—Improvements in furnaces used in melting steel and other metals where crucibles or pots are employed.
2742. Angelo J. Sedley, Regent Steeet—Improvements in chairs, sofas, and other articles of furniture, used to sit or recline upon.
2743. William E. Newton, Chancery Lane—Improved apparatus for obtaining motive power from air.—(Communication from George Marshall, New York, U.S)
2744. Isaiah Maiden, and Edward Hall, Ashton-under-Lyne, Lancashire—Improvements in slide valves for steam engines.
2745. Alfred V. Newton, Chancery Lane—An improved mode of, and apparatus for, sewing.—(Communication from William C. Hicks, Boston, U.S.)

Recorded November 8.

2746. James Cutts, Liverpool, Lancashire—Improvements in apparatus for ascertaining or indicating the number of persons that may pass through or over any particular place, applicable to omnibuses and other vehicles, theatres, ferrys, gardens, baths, and other places.
2747. Francois C. Husson, Paris—Improvements in power-looms.

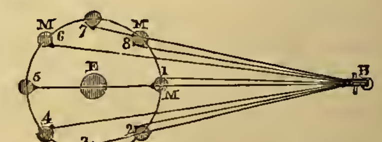
DESIGNS FOR ARTICLES OF UTILITY.

Registered from 9th November to 8th December, 1860.

Nov.	9,	4,300	Sherwood and Barrett, 52 Great Hampton Street.—"Improved pickle fork."
	10,	4,301	Maurice Samuel Johnson, 3 Wardell Terrace, Doctors' Commons, E.C.—"The segment table, being a stand to apply to endorsing, and embossing presses."
	15,	4,302	Robert James Ransom, Ipswich.—"The gun knife cleaner."
	15,	4,303	Charles Johnson Knight, 23 London Wall, E.C.—"Knight's gold leaf receiver to prevent superfluous leaf being wasted."
	15,	4,304	P. J. Marshall, 32 Treville Street, Plymouth —"Improved ship or house lantern."
	16,	4,305	Kennan and Sons, 18 and 19 Fishamble Street, Dublin.—"H. fence standard."
	19,	4,306	Farwig and Co., 63 Watling Street, E.C.—"A drinking flask to be called the rifleman's flask."
	21,	4,307	Ellis, Brothers, High Street, Exeter.—"Safety how for watch pendents."
	22,	4,308	Gervaise Bushe, Glencairne Abbey, Lismore, Ireland.—"A revolving disc for boot graters."
	23,	4,309	William Chesworth Caldwell, 19 King's Place, Commercial Road, St. George's East, E.—"Paragon trousers."
	27,	4,310	William Tonks and Sons, Birmingham.—"Rack pulley."
Dec.	1,	4,311	John Freeman, 53 St. Martin's Lane, W.C.—"A volunteer sandwich box."
	3,	4,312	John Webb, 21 Aldermanbury, E.C.—"Cigar holder."
	4,	4,313	Richard Telford, 15 Wrottesley Street, Birmingham.—"Towel holder."
	7,	4,314	Tasker and Sons, Waterloo Iron Works, Andover.—"Adjustable fastening for plough coulters."
	8,	4,315	John Hargraves and Son, Carlisle.—"Horse cloth or skirt."

TO READERS AND CORRESPONDENTS.

The Rotation of Bodies on their Axes.—At page 248 of our last number is given a letter from the Rev. Bertram Mitford, in which an error has been made by the draughtsman in Mr. Mitford's diagram, this we are anxious to correct. The figures in the diagram were incorrectly placed, and we have here re-engraved it, in order that Mr. Mitford's letter may be properly understood.



B. Marsden, Dewsbury.—We are not aware that there is any law to prevent steam carriages from running on common roads.

W. Walker, Dundee, will observe the corrected diagram, and will perhaps reconsider his communication to us.

STEAM—ITS MECHANICAL PROPERTIES AND ECONOMY AT VARIOUS PRESSURES.

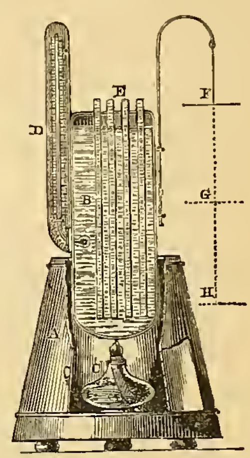
II.

Before proceeding to an examination of the mechanical properties of steam, it will be necessary that we clearly define the meaning of the leading terms to be used in the investigation of the following important questions, viz., evaporisation and condensation of steam. It would be well that we carefully examine the relations of known physical laws, so that in all our processes of reasoning we keep clearly in view fundamental principles, as this prepares us to form clear ideas of the various theories that may be advanced, and whenever we discover that we have diverged from fundamental principles, the sooner we return to them the better. All matter presented to our senses seems to exist in three different states, that is, solid, liquid, and gaseous; the state or form depending upon the amount of heat to which they are exposed, many of them assuming the liquid and gaseous forms at comparatively low temperatures. By intense heat all forms of matter are changed, with the exception of the diamond. In the examination of the theory or laws of evaporisation it will be necessary that we keep clearly in view the laws of heat and expansion, and also of electrical and magnetical influences. The first general term that we require a free use of, is heat. It has been clearly demonstrated that heat and mechanical force are identical and convertible, and that the action of a given quantity of heat may be represented by a constant quantity of mechanical work. If a small quantity of water be enclosed in a glass globe and heat is applied, expansion and evaporisation immediately follow, and if the heat be continued the fluid will pass into steam or vapour, the globe will then appear perfectly transparent, the pressure within it depending on the density of the vapour or steam it contains. It will be evident that the above effects, so far as they are immediately presented to our senses, are caused or produced by heat; but from close observation and experiments we know, that the fluid has contracted and expanded, and that the atoms or particles have formed arrangements which evolve electrical or magnetical influences, the vaporative force depending on the amount of energy or heat sustained. In the forces of cohesion and heat—the one is active in binding matter and the other is equally active in disuniting its atoms, and thus forming liquids and gases—the heat inducing expansion, the atoms continue to repel each other, thus increasing their capacity for electricity, and the greater the heat the greater the flow of evaporisation. The force of the vapour may be said to be formed within the mass of the liquid, and its repulsion from the surface depends greatly on the amount of heat sustained; when it has gained sufficient tension to resist the pressure equivalent to its atom, the equilibrium is for the time overcome or suspended, and by its electrical force it passes into space. If the molecular equilibrium of a fluid is disturbed by heat expansion follows; if by cold, its density is increased until it has assumed the point of greatest density. If the fluid be in contact with vapour it will condense a portion of the vapour until its molecular equilibrium is restored.

Let us endeavour to keep in view the experiments on the expansion and contraction of metals and fluids, as it may assist us in investigating the principles of evaporisation and condensation. From the metals and fluids we have a clear perception of contraction and expansion, and also of a mean point. The hypothesis I would offer is, that when expansion takes place the equilibrium of the molecular vortices becomes gradually suspended, and the dynamical energies (these being an extension of molecular energies) increase in a proportional ratio. In like manner when the fluids begin to resume their former density these dynamical energies decrease in a like proportion, and thus by heat or energies a polar arrangement of the atoms or particles of which the fluid may be composed is formed; the atoms of water in the vapour form having a greater capacity for electrical or magnetical influences are by this means repelled from all parts of the fluid into space. The various arrangements of the atoms producing all the diversified motions in inert matter, it depending on the one great primary cause, viz., energy or motion, which is co-existent with matter but independent of it. The term "inducing magnetism" appears too often in our works on physical science, thus leading the student to view electrical influences as secondary causes, and therefore preventing him from having clear perceptions of that great immeasurable primary cause.

The following experiments and observations will enable us to perceive the great influences exercised upon matter by electricity or magnetism. The accompanying engraving, fig. 5, represents the apparatus used for the purpose. In the frame or outer case, A, is fixed a round copper boiler, B, $6\frac{1}{2}$ inches in depth, and 3 inches in diameter, containing the oil to be heated by the lamp, C. A thermometer, D, is passed through a stuffing-box in the side of the boiler to indicate the temperature of the oil, when the spirit lamp was applied; four strips of soft iron, E, each 6 inches in length, $\frac{1}{2}$ inch in breadth, and 1-16th of an inch in thickness were fixed upright in the boiler. At 6 inches away from the side of the boiler was suspended, by a silk fibre, a sensitive magnetic needle, F, in a line with the tops of the bars, E. The induced magnetism or energy the bars receive from the earth repelled the south pole of the needle equal to 4 degrees. The temperature of the oil in the boiler was 60 degrees before the lamp was applied. From the subjoined table it will be perceived that the increased energy or magnetism which was evolved by the increase of heat continued to deflect the needle, thus indicating that the atoms of which the bars were composed were still continuing to undergo physical arrangements.

Fig. 5.



Tem.	Increase of Magnetic Power.
60°	4°·00
120	6·00
180	6·20
240	7·40
300	8·30
360	10·20
400	12·20

From this may we not infer an apparent relation to the evaporative force from the surface of the waters to the atmosphere, which is daily indicated at the temperature of 60 degrees, thus indicating a close relation to the laws of evaporisation. When the needle was lowered to the centre of the bars at G, the bars attracted either of the poles of the needle without indicating polarity. When the needle was lowered to H, the north pole of the needle was repelled and the south attracted. Again, the bars being cooled down and placed in a transverse position with the plane of the needle, its poles were equally attracted, thus clearly indicating that there are certain arrangements of the mass of atoms which evolve the electric and magnetic influences with a greater or less degree of intensity, the reverse of these arrangements being a suspension of the energies and an increase of the molecular, thus bearing a strong relation to the laws of cohesion and condensation. Expansion of steam from a given pressure bears the same relation to fluids as contraction does to metals, each thereby returning to their degrees of density. In the above experiment the suspended needle may be viewed as bearing a certain relation to the electrical state of the atmosphere.

There are many of the minerals which evolve electricity by heating or cooling; this property is indicated more particularly by crystallised bodies, the most remarkable effect is shown in tourmaline, the forms of its crystals are a nine-sided prism, terminated by a three-sided pyramid at the one end, and a six-sided pyramid at the opposite end; the one end indicating positive and the other negative electricity. When this mineral has been exposed to intense heat its poles may be reversed. There are also other mineral crystals which present a number of poles when heat is applied to them, thus showing that the various arrangements of the atoms or crystals indicate various poles.

From the observations of Laplace and Lavoisier, when experimenting on the conversion of water into vapour and its condensation, it was observed by them that it was attended with electrical indications. A hot-plate of metal was placed upon a gold leaf electroscope and water dropped on the plate from a sponge; at the instant the vapour rose the leaves of the electroscope diverged, indicating negative electricity, the vapour being positive. By others it has been observed that evaporisation of water by ebullition produces negative electricity in the fluid, the vapour being positive; but when condensed into water it again becomes negative, leaving the atoms it was last in contact with in the positive state. The following extracts from an article by Mr. Rowell, in the *Philosophical Magazine*, January, 1842, show the agency of electricity in evaporation:—

"The following experiment was made to prove that evaporation would not go on so freely from an insulated vessel as from an uninsulated one.

"In a warm room, over an oven in daily use, I suspended, by silk threads, two shallow vessels 8½ inches in diameter, containing 8 ounces of water each; a small copper wire was hung from one vessel to the earth to take off the insulation; both vessels being similarly suspended in every other respect. After being suspended 25 hours the insulated vessel had lost 2 oz. 11 dwts and 15 grains, and the other vessel 3 oz. 6 dwts., showing an excess of evaporation from the noninsulated one of 14 dwts. 9 grains.

"I have tried similar experiments with water placed in the rays of the sun, and on all occasions the evaporation has been greatest from noninsulated vessels. There is a difficulty in obtaining correct calculations from the above experiments, as it is scarcely possible to keep up complete insulation from electricity, and the vessel of water must have its proportion of electricity, when placed in an insulating situation, which will assist the evaporation for some time; but, I believe, if complete insulation could be obtained, and a vessel left without any electricity, that no evaporation would go on at moderate temperatures."

This experiment I believe to be correct, as I have found similar results.

In a paper published by Mr. Armstrong, of experiments made at Newcastle, November, 1840, containing experiments and observations on the electricity of steam from steam boilers, he says, "When standing on an insulating stool, and holding an iron conducting rod immediately above the safety valve, and bringing the other hand near a conducting body, sparks were obtained of about half an inch long, and by elevating the rod farther above the valve the length of the sparks increased, until the rod being raised about 5 or 6 feet above, the valve sparks are obtained 2 inches long. Small sparks were obtained when the rod was held in the atmosphere 2 or 3 feet from the jet of steam, and even when the rod was held in the volume of steam, floating at the roof of the shed under which the experiments were conducted, sparks were drawn down as by an electrical conductor from a thunder-cloud, whilst the person insulated felt a sprinkling of moisture on his face and hands. The electricity obtained from the steam was positive. After experimenting with various conductors a bunch of pointed wires, of different lengths, was attached to one end of the iron rod, the other being terminated by a knob. The rod was held with the wires pointing downwards in the jet of steam, and sparks of 4 inches were drawn from the knob almost as rapidly as they could be counted, while at the same time a stream of electricity was passing off from that part of the rod which was nearest the funnel of the engine. Perceptible sparks were obtained when the points were held in a clear atmosphere 8 feet from the nearest part of the jet. When the valve was suddenly lifted in a darkened shed the edges of the lever and the margin of the brass cap which surrounded the valve became luminous; most distinct at the instant the valve was lifted, but becoming very faint after the lapse of a second."

I am quite aware that the above has been partly explained, but still there is a mist hanging over it. There is but little doubt that as our knowledge becomes extended in this science, the electrical energies of evaporisation will be freed from that obscurity which at present dimly veils this department of electrical research.

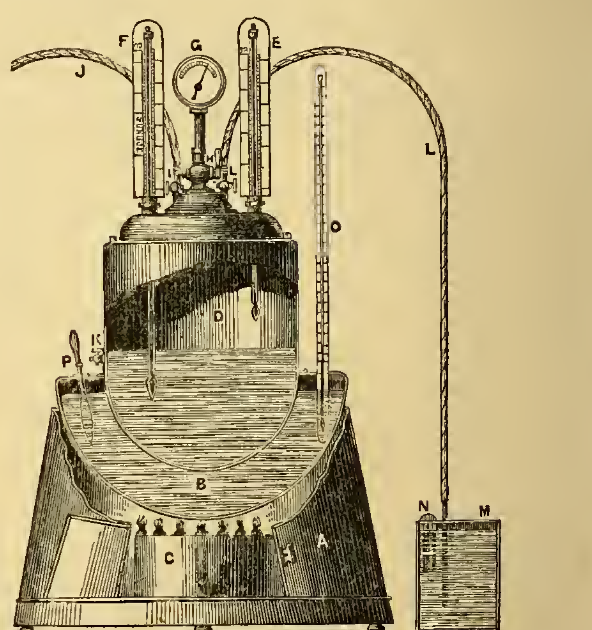
The indications of the electrical forces in the atmosphere have been beautifully illustrated by an instrument, the invention of Professor Wm. Thomson, its performance being so perfect that the electrical state of the atmosphere has been photographed by its means. The name of Professor Thomson will at all times be associated with the sciences of heat, electricity, and magnetism, he having mathematically and experimentally demonstrated the correctness of many of its fundamental and most important principles.

MECHANICAL PROPERTIES OF STEAM.

We shall now proceed to an examination of the mechanical properties of steam in its relation to the steam engine and the economy of heat. It will be apparent from the general principles advanced, that the properties of steam may be reasoned on mechanical principles, heat being a primary mechanical function. The application of heat to a fluid produces expansion and vapour, which combine in giving mechanical action, that is, *heat fluid* produces expansion and vapour; these combine in giving power to the steam engine. The mechanical effects or results in this combination may be stated as *impulse heat* applied to matter; fluid produces vapour *motion*, the force depending on the amount of heat sustained. Thus we perceive the mechanical relation that subsists between vapour or steam; its accelerative motion or pressure is in proportion to the amount of heat applied. The particles of vapour begin slowly to rebound against the sides of the vessel that contains them. The heat increasing, the motion of each particle is accelerated and rebounds with increased energy; so long as there is no motion given out, the full power is maintained, but the instant that motion is given out, the rebounding of the particles decreases in proportion to the amount of energy or power given out; the instant that the whole fluid has assumed the vapour form its density or dynamical energy is for the time fixed, except what may be gained from expansion if the heat be increased. This will be apparent, as we have only two functions, that is, heat and vapour, the fluid having passed into the vapour form.

In order to prosecute my experiments on this subject and observe the points of pressure in their various stages with a view to the economy of heat, I constructed the apparatus shown in the accompanying fig. 6. It consisted of the usual frame or outer case, A, having set in it a semi-circular cross-vessel, B, containing oil to be heated by the spirit lamp, C; through the cover of this vessel is inserted the spherical end of a round copper boiler, D, immersed in the oil, and constructed to contain one gallon of water, leaving an equal amount of space for steam above. There was attached to the cover of the boiler, D, two thermometers, E and F;

Fig. 6.



the one marked E, is shown in the steam space, the other, F, is in the water, each thermometer was marked to indicate the pounds of pressure corresponding to the degrees of heat, these being deduced from the tables of M. Regnault. There was also a pressure gauge, G, attached to the centre cock, H. The stop-cock, I, was used for blowing off, and the cock, K, for indicating the height of water in the boiler. The tube and stop-cock, L, was for the purpose of conveying steam at different pressures to the copper vessel, M, which contained one quart of water, in which was fixed a thermometer, N, which could be read from the outside through a transparent slip of mica. My object in this arrangement was to find the amount of heat given out at different pressures by a measured quantity of condensed steam. The cistern, B, in which the boiler, D, is set, was sometimes used for heating the water by linseed oil, its use being to give a more regular heat, and observe the difference of temperature between the oil and the water. On the one side is inserted the thermometer, O, to indicate the heat of the oil, and on the other, the agitator, P, was used for keeping the oil in motion when the lamps, C, were applied. In this instance the oil cistern, B, was removed and the lamps applied directly to the bottom of the water boiler, D, the first experiment with this apparatus was to find the amount of heat or fuel which was necessary to maintain any given pressure, each burner during a given time would bear a certain proportion to a measured quantity of fuel. One of the burners of the spirit lamp, C, was lighted, the thermometers in the water and steam were noted at every five degrees, and the minutes and seconds of time noted from a chronometer;

at the end of one hour a second burner was lighted, and at the end of each succeeding hour an additional burner was lighted, until the water thermometer, E, indicated 300 degrees. In plate 267 are shown several diagrams of these experiments. Fig. 1 shows the relative rise of pressure and heat of the steam in the boiler in certain periods of time. On referring to this chart of the lines of heat and pressure it will be observed that the degrees of heat corresponding to the thermometer are marked along the base line, and the time occupied is indicated on the upright line on the right hand side, so that the time taken and the quantity of heat absorbed in raising any given number of degrees can be easily perceived. That the chart may be more clearly understood the following table will convey an idea of the construction

Deg.	M.	S.	Deg.	M.	S.	Deg.	M.	S.
50	0	0	75	19	20	100	40	10
55	3	15	80	23	10	105	45	5
60	8	40	85	27	20	110	50	0
65	11	20	90	31	30	115	55	0
70	15	35	95	35	20	120	60	0

of its lines. It will be observed from the accompanying table, or the chart, that the temperature of the water before the burner was lighted was 50 degrees, and that the heat from the first burner in one hour raised the temperature of the water to 120°, the dotted points at every five degrees indicate the guide to the drawing of the curve, the small circles marked 1, 2, and 3, represent the time when each burner was lighted. It has already been observed that the first burner raised the water to 120°, equal to $1\frac{1}{2}$ lbs. vacuum; the second burner being lighted raised the temperature to 204°, equal to $12\frac{1}{2}$ lbs; the third burner raised the temperature to 259°, equal to 20 lbs.; the fourth burner raised the temperature to 281°, equal to 35 lbs.; and the fifth burner raised the temperature to 297 degrees, equal to 56 lbs. In order to verify the above observations, the lower curve, or fig. 2, is formed from the five burners being lighted at the same instant, (after the water and boiler had been cooled down to its original temperature.) It will be observed from the chart that the difference between the two curves is not more than five degrees, thus proving the accuracy of the experiments, and showing the close relation of the curves to that of heat. The thermometer in the steam was at first about 15° behind that in the water, but it gradually approximated until at 215°. They both indicated alike, and continued to do so throughout the observations.

On referring to the chart it will be observed that the third burner raised the pressure to upwards of 20 lbs., from this it would appear that the points of greatest economy in pressure is from 15 lbs. to 20 lbs., it will also be observed that the fourth burner has only increased the pressure 14 lbs., thus showing a difference of only 8 lbs., the fifth indicating a further proportional decrease. On referring to the former article it will be observed, that the metals and mercury clearly indicated a mean point of expansion, and the water, so far as I could proceed with it, indicated a proportional increase up to 210°. Keeping these points clearly in view, from the chart it will be perceived that 250 degrees of heat equals 15 lbs. high pressure to the square inch, or one atmosphere.

In the former article I have referred to the point of absolute zero, which fixed at 493° 2″ from 32°, the freezing point, but if we assume it from the point of greatest density of water, 39° 2″, this would make the degree of absolute zero, 500°, when all physical energy would cease. I further stated my belief that there was also an absolute point of heat, when the dynamical energies of gaseous vapours would be equally destroyed by intense heat. Let us assume the absolute point at 500°, the mean whereof would be 250 degrees, this coinciding with the degree of heat equal to 15 lbs., or one atmosphere, and apparently the point attended with the greatest amount of economy. A mean point could not be observed in the water until a portion of it had passed into the vapour form, when a mean point is indicated about 250°. When we come to the question of absolute heat in the expanding and superheating of steam it will be found that there is a point of heat at which the dynamical energies are equally suspended.

The curve, fig. 3, was formed thus:—the cover of the boiler having been removed, so as to allow a free evaporation from the surface of the water when the heat was applied; from the chart it will be observed that the temperature of the water was 52°, the first burner being lighted raised the temperature of the water in the space of one hour to 112°, the second in a like space of time raised it to 156°, the third to 186°, the fourth to 207°, the fifth to 212°, the boiling point From these observations it will be perceived that the same amount of heat is expended in raising the water to the boiling point as in maintaining a pressure of 56 lbs. This conveys to us an idea of the amount of heat carried off in vapour or steam.

On the upper part of the plate there are two lines, D and E, which are laid down from tables formed in a similar way to the others; the line, D, is formed from the indications of the thermometers, O, fixed in the linseed oil cistern, B, and the line or curve, E, is formed from the thermometer, E, in the steam space of the boiler. By referring to the engraving, fig. 6, it will be observed that the water in the boiler receives its heat from the linseed oil, and from the chart, it will be perceived that the heat of the oil ranges much higher than that of the water, although the water may be viewed as being surrounded with the oil. It will be observed, that if the oil be kept at a temperature of 326°, the pressure in the boiler would be equal to 26 lbs. to the square inch, suppose the lamps to be removed, the pressure in the boiler would remain nearly steady, until the oil fell to a similar temperature to that of the water in the boiler; from this it would appear that the water absorbs the heat from the oil and from this point they decrease in an equal proportion. If boilers were made with false bottoms, and these filled with linseed oil, pressures of from 15 lb. to 20 lb. could be steadily maintained by heating the oil to about 300°, which would be little more than the mean of the boiling point of oil, that being 600°. By this arrangement the boiler could never be injured by over-heating, and there would be little danger of its being over-pressed, as the heat of the oil would at all times regulate the pressure.

PAUL CAMERON.

NEW COLOURING MATTER FOR DYEING PURPOSES.

THE production of colouring matters from aniline suitable for dyeing, and embracing a great variety of delicate tints, has given a vast impetus to this branch of industrial research. Practical chemists have cast about on all sides in search of new products or materials from whence they could obtain either new tints, or means of rendering fugitive colours permanent. And it is certain that of late an extraordinary degree of success has attended the labours of those who have worked in this field of economic chemistry. One of the most recent contributions to our store of knowledge in the art of dyeing, has been communicated to Mr. J. H. Johnson, and consists in the production of what the inventor, M. Louis H. Obert, designates panphiteic acid. This substance is eminently useful in producing a number of fast colours suitable for dyeing The colouring matter is produced from plants of all kinds. The plants are firstly subjected to heat, either by means of steam admitted into a closed vessel or receiver, in which the plants are placed, or they are subjected to distillation, to extract the colouring matter.

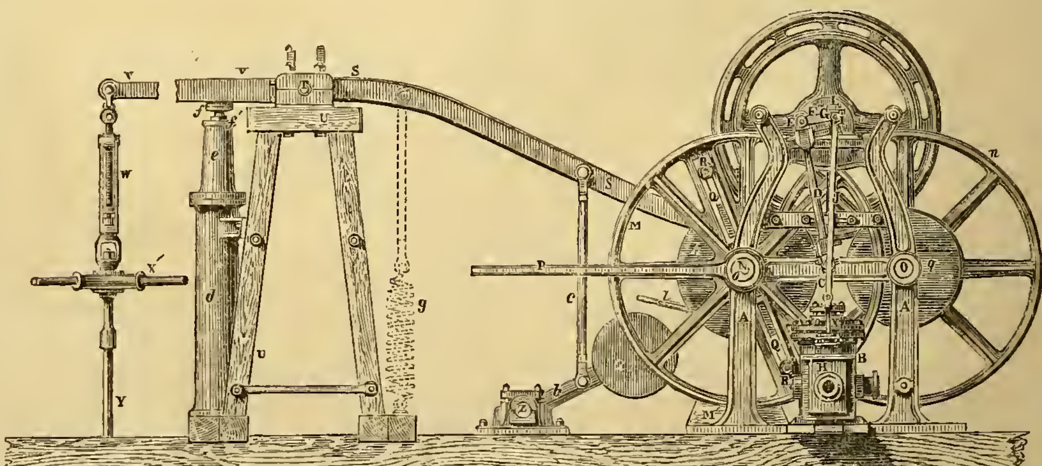
The decoctions resulting from such treatment, are, after being separated from the insoluble matter or pulp, to be placed in suitable vessels, to which decoctions nitric acid is to be added in proportion to the density or strength of the resulting decoctions. After the addition of nitric acid, the solution is to be evaporated. The residuum so obtained will contain panphiteic acid, and this residuum may be diluted or dissolved in distilled or in acidulated water. Should it be desired to obtain panphiteic acid in a state of purity, the solution may be re-evaporated and re-dissolved until the acid is obtained of the desired condition. Instead of employing nitric acid, other acids and metallic or other salts may be mixed therewith. In order to obtain panphiteic acid in a fluid condition, evaporation need only be carried to a degree sufficient to concentrate the solutions until the desired strength is obtained. The resinous, albuminous, or other bodies which are precipitated during the different processes, produce also panphiteic acid when they are treated in the same manner as the decoctions, as do also the precipitates which are formed during the treatment of the plants, or during the concentration of the decoctions. A more economical process consists in treating the decoctions according to the nature of the plants from which they are obtained with suitable acids or metallic salts, either in combination or singly, and in such proportions as will cause the resinous, albuminous, and other bodies to precipitate. All other bodies possessing the property of promoting precipitation in such solutions may be employed. The precipitates are collected on filters and are treated with hot or cold nitric acid, the precipitates being either in a moist or in a dry state, pulverised or otherwise. The quantity of acid to be employed is in proportion to the state of dryness of the precipitates. According to the nature of the precipitates and the colours or shades it is desired to obtain; to the nitric acid is added, such other acid or metallic salts as will complete the process. The same process is followed in manufacturing panphiteic acid from all kinds of resins, gums, wax, and in fact, from all vegetable exudations. The substances above referred to are to be dissolved in suitable solvents, which may be alcohol, either ammonia or bisulphuret of carbon. When the solution has been effected, it is submitted to the action of nitric acid alone, or with such additions as have been mentioned, on having first submitted the before mentioned substances to the action of nitric acid, they are then exhausted by means of either alcohol, ammonia, bisulphuret of carbon or any other solvent. When panphiteic acid is thus obtained, it may be purified by repeated solution and evaporation, according to the degree of purity desired. When the before-mentioned decoctions are separated from their precipitates, they may be treated in the same manner as the precipitate itself is operated upon. By concentrating the decoctions, and, with the addition of alkalies or of alkaline salts, to such of them as do not contain a sufficient quantity thereof, and by treating them in the manner described with acids and metallic salts, a very pure mordant is obtained, which may be advantageously substituted for those mordants hitherto used by dyers in the dyeing of animal substances. The mordants of iron may be combined with these before-mentioned mordants, for those textile fabrics for which mordants of iron are now used. Panphiteic acid may also be used as a mordant, as it also produces a yellow dye without the aid of any agent, and can be substituted for a mordant whenever a yellow ground is required. When panphiteic acid is obtained from catechu or plants similar to catechu, it colours vegetable substances yellow without the employment of any mordant. Different colours may be obtained by combining panphiteic acid with other colouring matters, and by the following processes, various green colours may be obtained. In order to obtain a light green colour, equal quantities of prussiate of potash and panphiteic acid are to be dissolved either together or separately, and subsequently mixed. It is optional in making this mixture, whether panphiteic acid or picric acid, or even both mixed together be employed. The solution must be more or less diluted, and silks or woollens acquire a clear light green dye by simply dipping them in this acidulated bath without the addition of any salts of iron. The simple addition of a sufficient quantity of nitric or hydrochloric or other acid suffices in order to obtain clear and brilliant tints. In order to obtain all the shades of dark green, the fabrics to be dyed are immersed in a bath containing salts of iron, preference is given to the nitrate of iron. In order to prevent the baths composed of the salts of iron from staining or spotting the fabrics to be dyed, a very small quantity of sulphuric, muriatic, or other acid may be added to the solutions. These baths may be used either hot or cold, according to the nature of the fabric to be dyed. It is evident that all yellow colouring matter, which will combine with the prussiate of potash will produce the same green dye. The relative quantities of the different bodies which are mixed together, may vary *ad infinitum*, according to the tint of green required. Fabrics which have been dyed yellow by means of this new acid, may be made to assume all shades of grey by employing a bath of logwood, with, or without the addition of an alkali. Acids cause these greys to fade slightly, but alkalies restore them to their original tint. By being subjected to the repeated action of sulphuric acid and of alkalies, these yellow tints may be heightened several shades.

APPARATUS FOR BORING AND WINDING IN MINING OPERATIONS.

A compact and highly efficient arrangement for actuating the boring tools, lifting the rods, and performing other operations connected with mining, has been recently brought into practical use by Mr. John Paton, of the Govan Bar Iron Works, Engineer. In practice, this apparatus has been found to effect a most important saving of manual labour, and at the same time the work has been done far more efficiently than under the old system. To render our descriptive remarks perfectly intelligible, we have engraved the apparatus in longitudinal elevation and plan.

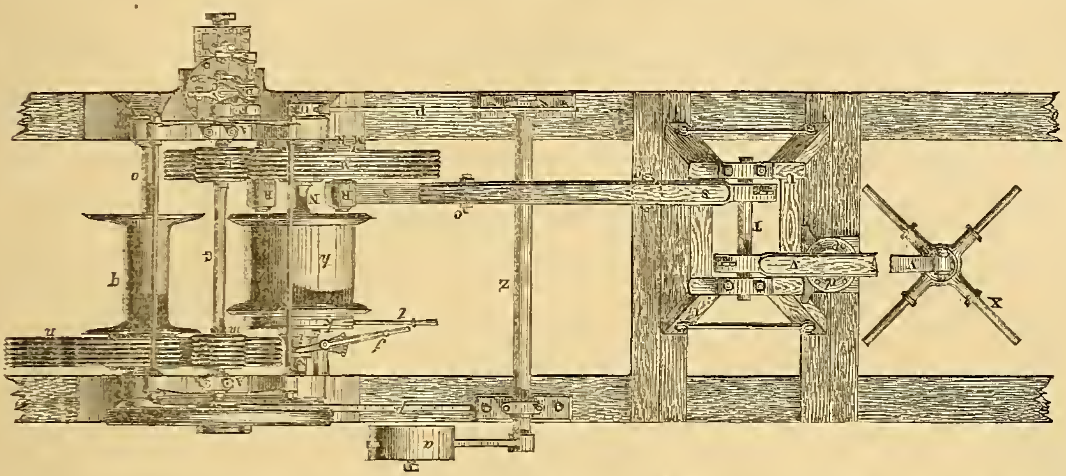
Fig. 1 of the accompanying illustrations, is a side or longitudinal elevation of the apparatus, and fig. 2 is a plan corresponding. The machinery is arranged on a framing or foundation of timber, on the parallel beams of which are erected the open cast-iron framing, A, consisting of a pair of end standards, which are connected by transverse tension rods. Upon a sole plate cast on and extending outwards in a lateral direction is arranged a small engine, B, by means of which the moving parts of the apparatus are actuated. The piston rod, C, of the engine is attached to the connecting rod, D, the upper end of which is fast to a crank pin, E, which drives the crank, F, on the main shaft, O. The reciprocatory movement of the valve in the valve chest, H, is obtained by means of a crank, I, fitted on the outer end of the crank pin, E, which crank is connected by the rod, J, to the valve spindle, K. The arrangement of the other parts of the engine being similar to those in ordinary use, it is unnecessary to enter into a detailed description of the same.

Fig. 1.



On the shaft, G, at the end nearest to the engine is fitted a pinion, L, which is preferred to be of the angularly grooved frictional class, this pinion imparts motion to the grooved wheel, M, which is keyed to the transverse shaft, N. In fitting this shaft, its journals are arranged eccentrically in the bearings, O, which are carried in the pillars of the framing, one of the bearings is made to project sufficiently to admit of the eye of the hand lever, P, being passed on to it, and attached thereto. With this arrangement when the hand lever, P, is raised, the shaft, N, is lowered sufficiently to throw the wheel, M, out of gear with the pinion, L, on the shaft, O, which comes down on the break block, M[1]. It is by means of the wheel, M, that the necessary vertical intermittent or jumping motion is imparted to the boring tool. In two of the arms of the wheel are formed the radial slots, Q, in which are fitted the adjustable studs carrying the antifriction rollers, R. The studs project inwardly from the face of the wheel, M, so that as the wheel rotates the rollers alternately come into contact with and depress the end of the lever, S. This lever is fast to a short horizontal shaft, T, the bearings of which are carried on the upper end of the framing, U. To the shaft, T, is keyed a second lever, V, to the free overhanging extremity of which is suspended the swivel, W, and the brace head or hand wheel, X, for giving a rotatory motion to the boring rods, Y, and the boring tool at the lower end of the series. The weight of the rods, Y, on the lever, S, is counteracted to the required extent by an arrangement of a counterweight used in conjunction, if required, with a hydrostatic or pneumatic cylinder. On the foundation frame are arranged the pedestal bearings of the transverse shaft, Z, one extremity of which has fast to it a lever carrying the counterweight, *a*, which is adjustable by means of a pinching screw on its supporting lever, to admit of the weight being varied according to the length of the rods, Y. The shaft, Z, has fast to it a second lever, *b*, which is connected by the link, *c*, to the lever, S. In addition to this arrangement, and to avoid the use of very heavy counterweights, a small cylinder is arranged below the lever, S; inside the cylinder is fitted a piston of the ordinary kind, the rod of which is connected to the lever, S. At the upper part of the cylinder is fitted a valve opening inwards, the valvular passage communicates with a water supply pipe which is connected to a small cistern arranged in convenient proximity to the cylinder. An outlet pipe, the passage of which is controlled by a cock, is fitted to the cylinder; the end of this pipe may be conveniently carried into the supply cistern. With this arrangement by adjusting the opening of the cock in the outlet pipe the water is allowed to escape more or less quickly from the cylinder, so that the boring tool has the requisite degree of force imparted to it and no more, the weight of the rods being counteracted by the presence of the water in the upper part of the cylinder. Upon the lever, S, being depressed by the rollers, R, the piston descends and a further supply of water flows into the cylinder through the valve, which serves to check the sudden descent of the rods, when the lever, S, is liberated from the rollers. This arrangement may be modified so as to use an air cylinder, in place of hydrostatic pressure, for resisting the weight of the rods on the lever, S. In front of the framing, U, is fitted a spring buffer apparatus which serves to modify the force of the blows when a new boring tool has been screwed to the rods. This consists of the cast iron pillar, *d*, on the upper part of which is a cylinder, *e*, partially filled with discs of vulcanised India-rubber, on which rests a disc on the spindle of the buffer, *f*. This spindle is screwed, and by means of the nut, f^1, the buffer may be raised so as to keep the lever, V, raised, so that when the men work the brace head, X, their pressure upon it compresses the India-rubber, and a series of light springing blows are imparted to the boring tool, which serve to clear out the hole, when a new boring tool is put into requisition. In lieu of the arrangement of a spring buffer, a helical spring, *g*, may be used for the purpose of keeping the front end of the lever, V, up, when required. In working with this apparatus it is preferred to erect over the place where the boring is made a lofty staging, so as to admit of the rods being hung thereon in long lengths. This staging is preferred to be about forty-five feet in height,

Fig. 2.

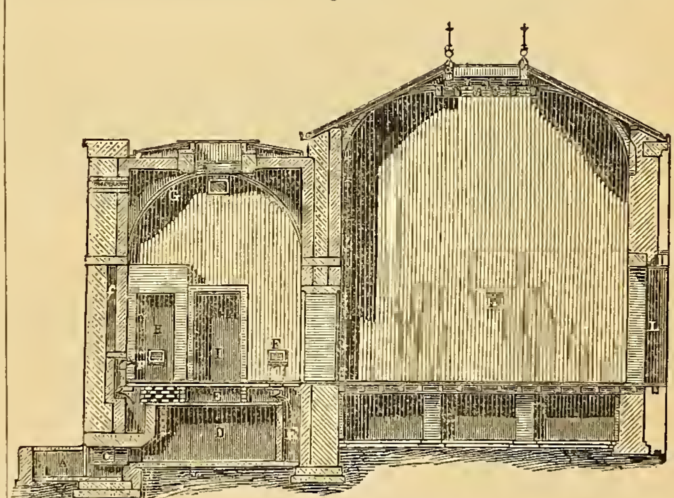


with convenience for the workmen to ascend to an open gallery, in the floor of which are cut slots to admit of the chain and wire rope passing through, as well as for hanging the lengths of rods. To the cross beam overhead are hung the two pulleys, over which are passed the chain for lifting the rods and the wire rope for raising and lowering the pump. The arrangement of the staging is to facilitate the use of the rods, to save time and avoid taking them apart in the several six feet lengths every time they are drawn up. The shaft, N, has running loosely upon it the drum or barrel, *h*, which is put into and out of gear with the shaft by means of the coupling clutch, *i*, actuated by the hand lever, *j*. This drum is used for the wire rope, for raising and lowering the pump, and to afford the necessary convenience for cleansing the bore when required. The rotatory movement of the drum, *h*, is checked, and regulated by the friction strap, *k*, which is tightened by the handle, *l*. The boring rods are raised and lowered, and other winding operations performed by means of a chain wound upon a secondary barrel actuated from the first motion shaft, G. This shaft has upon it a second frictional pinion, *m*, which gives motion to the wheel, *n*, on the shaft, *o*; the journals of this shaft are arranged eccentrically in their bearings as hereinbefore described in referring to the shaft, N. In this way, by means of the hand lever, *p*, the wheel, *n*, may be instantly put into or out of gear with the pinion, *m*. Although the patentee has shown in the accompanying engravings the shafts, N and *o*, as being driven by means of what is termed frictional gearing, he does not by any means intend it to be understood that he confines himself thereto, as the ordinary spur gearing may, if preferred, be used in place of the frictional gearing. The shaft, *o*, has fast to it the winding barrel, *q*, on which the rope or chain for effecting the winding operations is wound. With these arrangements either of the winding barrels, *h* or *q*, may be brought into operation as required, or remain quiescent whilst the wheel, M, is operating the lever, S, and the boring tool. Instead of the arrangement of the duplex levers, S and V, the framing, U, may be of cast-iron arranged upon a moveable sole plate traversing on racks fitted in the foundation framing, so as to be easily moved to and fro. On the upper part of this framing the lever is keyed to the cross axle, so that by shifting the supporting frame to and fro, the fulcrum of the lever may be altered as required, according to the length of stroke and percussive force it is desired to impart to the boring rods. This arrangement admits also of the lever carrying the boring rods, being actuated by means of a cam in lieu of the wheel, M, and rollers, R: this cam may be arranged loosely on a transverse shaft, and be brought into gear therewith by means of a coupling clutch or other similar contrivance. The apparatus is also arranged to admit of various minor modifications. In this manner boring, winding, and other generally similar mining operations are performed with great facility, the only part requiring manual attention being the turning of the boring tool by means of the hand wheel, X. Mr. Paton's mining apparatus has been put into operation in the neighbourhood of Glasgow, and it has, we are given to understand, afforded unqualified satisfaction, from the great assistance it has been to the operators, as well as the rapidity with which the work can be carried out with the aid of this most useful auxiliary.

THE TURKISH BATH.

Travellers in the East generally speak in terms of high eulogium of the system of bathing practised by the Orientals, and of its grateful effect upon the human frame, when the system is enervated by the heat of the climate. There are few of us who have not dwelt with a certain degree of fascination, upon the vivid pictures of this luxurious portion of eastern life, as pourtrayed by many of our travellers. Into the question as to whether the application of water at a comparatively high temperature, to the body when already in a state of lassitude from the effects of atmospheric heat, is judicious, we will not pause to enquire. It is, however, an objection that does not apply with the same degree of force to the use of the bath in our colder clime. Public attention has of late been more particularly directed to the peculiarities of the Turkish bath, on account of its introduction into this country as a substitute, or rather as a refinement, upon the ordinary mode of bathing. Through the kindness of Mr. G. Somers Clarke, of Cockspur Street, Architect, we are enabled to place before our readers the particulars of the very complete Turkish bath recently erected at Cowley Manor, Gloucestershire. Fig. 1 of our illustrative engravings, represents a sectional elevation of the bath; and fig. 2 is a plan corresponding. Outside the walls of the bath, is the the stoke hole, A, which is contiguous to the coal store, B. Branching off laterally from the stoke hole, and extending under the walls of the

Fig. 1.



building, is the furnace, C, by means of which the rooms above are heated. From the furnace, C, the highly heated products of combustion pass too and fro along the flue, D, before reaching the chimney, *d*. The flue is surrounded by a hot air chamber, E; the air which is admitted thereto becomes highly heated and flows along beneath the floor of the bath room, and upwards through the openings, F. The bath or hot room, G, is eleven feet square, and fourteen feet high from the level of the floor to the crown of the vault. This room is executed in rubble walling twelve inches thick, with a cavity of six and nine inches of brickwork as an internal lining, making a total thickness of two feet three inches. The brick lining is bonded at intervals of every eight courses in height with hoop iron, laid transversely with the walls. The vaulting is a simple semicircular Roman groin of two half brick rims in thickness set in cement, with a cavity of two inches, bonded at intervals to make sound work. Light is introduced at the crown of the vault by a circular opening, or ring of freestone, two feet six inches in diameter, moulded and double rebated to receive two sheets of glass—the outer of clear plate of half an inch in thickness, and the inner of coloured and embossed plate of similar thickness. Space is left in the rebates of the stone for the expansion of the glass at high temperatures. Below the floor level are two chambers, respectively of one foot and three feet six inches in height The lower chamber, D, may be sub-divided into two parts—the hypocaust or inner labyrinth of smoke flues in connection with the furnace, and the hot air chamber, E, surrounding the hypocaust, and communicating with the upper hot chamber immediately under the floor of the bath. The furnace C, is of the ordinary kind, three feet long one foot wide, and fifteen inches high. The bars are bedded in Staffordshire fire-brick, and the fire chamber is built of the same material The smoke flues, D, are nine inches wide, are likewise built, except the two lower courses of fire-brick, and are covered with fire tiles grooved on the butting edges to receive a cement grouting, and so render the escape of smoke impossible The surface of brick wall and tile coverings exposed to the heat generated from the smoke flues is about 484 superficial feet. Ten cast-iron valves, nine inches by six inches, are built in the external walls, for the admission of fresh air into the hot chambers, and regulate the temperature, as well as to promote an ascending current to ventilate the bath itself. The floor of the bath is laid with three inch slabs of freestone of the county, perforated all round and over the two hot air chambers, in addition to which nine air flues, *f*, fourteen inches by nine inches, are formed in the side walls carrying the air from the heated chambers into the bath, by similar sized openings, F, made twelve inches above the level of the floor. The smaller room or closet, H, affords the means of obtaining an increased temperature. Two rooms are

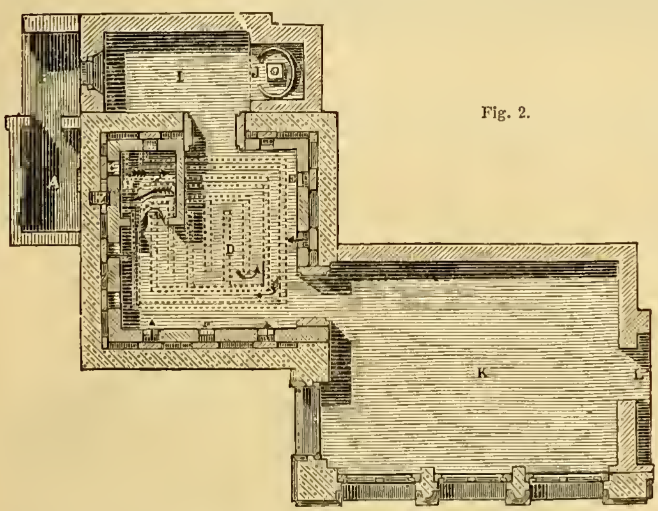


Fig. 2.

recommended to secure temperatures of 120° and 160° or 180° where practicable. Adjoining the bath is a washing room, I, fitted with cisterns of hot and cold water, the former supplied by a boiler heated by the furnace flue. The floor is paved to a current for drainage, and the walls lined with China tiles. A needle bath, J, consisting of seven broken rings of three-quarter inch perforated iron tubing, screwed to a standard three inches in diameter, and connected with a lead service from the cold water cistern, act, by a valve from the cistern through the perforations, as a powerful horizontal shower bath. There is also a copper rose, twelve inches in diameter, served from a small tank above, in connection with the hot and cold cisterns, and furnishes a vertical shower bath of hot, cold, or tepid water as may be required. At the opposite end of the washing room to the needle bath, is a one-and-a-half inch lead service, with valve cocks from both cisterns, giving douche or syringe baths at the option of the bather. The cooling or lounge room, K, leading from the bath, G, measures eighteen feet by thirteen feet, and sixteen feet high to the top of the cove, and forms not the least important part of the Turkish bath economy. The flat soffit above the cove is executed in panels twelve inches square, having perforated enrichments therein in connection with the external ventilators in the roof. An abundance of light and air is essential in this room, consequently four French casements (ten feet high and five feet wide), on the south and west sides, opening outwards to save space inside the room, give the required opportunities of exposure to the atmosphere during the process of drying and cooling, after the sweating process is completed. The floor is lead, in parquetrie, on inch rough boarding; whilst low divans, couches, and grasshopper chairs, with attendant dwarf coffee tables, compose the sole furniture of this room. The walls and vaulting of the bath are plastered in Martin's cement, and the walls and ceiling of the cooling room are plastered, floated, and set for painting. The cooling room leads into the corridor, L, which forms the approach to the bath. The whole of the appointments are very complete, and reflect high credit upon Mr. Clarke's judicious taste.

SILVER IN SEA WATER.

The following is an extract from the reports of the "Academie des Sciences" of Paris, containing some curious historical details concerning the presence of silver in sea water. According to M. Chevreul, this interesting discovery was made as far back as seventy years, and the probability of the fact was broached by Proust. In support of this assertion, in a letter dated Madrid, 4th April, 1787, and written by this learned chemist to La Metherie, who published it in the *Journal de Physique*, of that year, we read as follows:—"Of the action of sea water on silver. Should the bed of the ocean ever become habitable land, those who would tread this new continent would no doubt recover the immense treasures which the fathomless deep has engulphed since the old and new worlds have held intercourse together. The wreck of the vessel *Le Saint-Pierre de Alcantara,* off the coast of Portugal, enables us to predict what kind of transformation silver will undergo in times to come. The marine acid, which is the chief element in the saltness of sea water, departing from the laws of attraction which fix it to its base, will have changed this metal into chloride of silver. The short time which elapsed between the wreck and the recovery of the coined silver, was sufficient to deteriorate its surface to the depth of a quarter of a line ·023 of an inch. These coins were brought up out of the sea covered with a black layer, which peeled off in scales, and which I recognised as being chloride of silver."

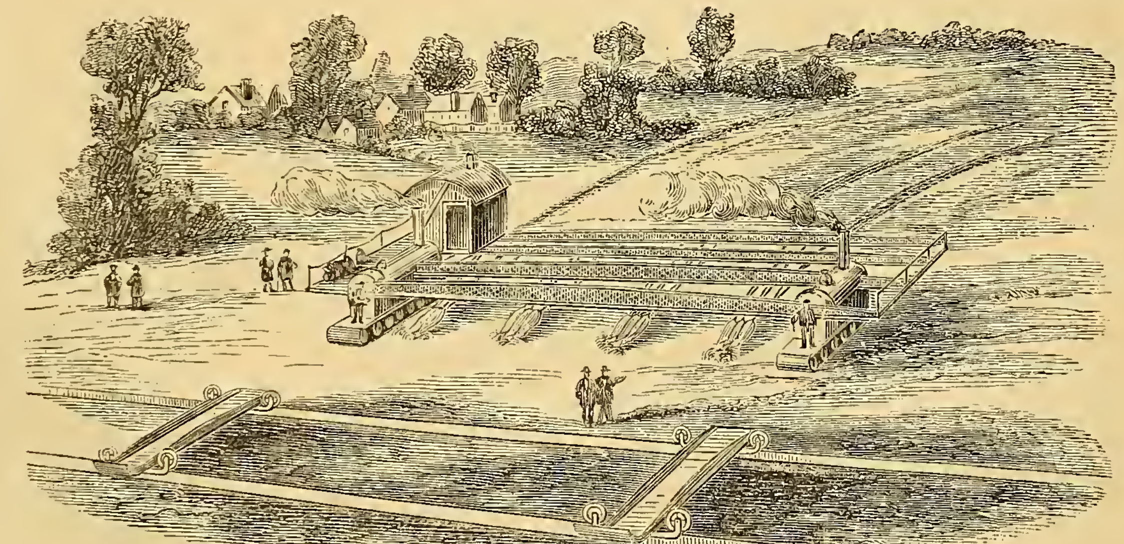
In a subsequent memorandum, published in 1799, in the *Journal de Physique,* the following passage occurs relative to the indications of mercury in sea water and in sea salt:—"Should any one, after reading this, take the trouble to observe if the sheathing of a ship recently launched becomes silvered over in any part, especially when she begins to plough the waves for the first time—if he were to suspend a plate of gold in sea water, and observe the changes it would undergo, he might flatter himself perhaps of being able to add another item to the natural history of sea salt. Who knows but that the destruction of ships' sheathing, sometimes so rapid, the cause of which is far from being established, is not caused by the presence of mercury in a larger quantity in some seas than in others?"

Here the point rested, till a few years since Messrs. Malaguti, Durocher, and Sarzeau by a series of most interesting experiments, proved that sea water contains chloride of silver. A short time afterwards, Mr. Forchamme, of Copenhagen, a very eminent scholar, confirmed the fact with regard to the water of the Baltic. It seems from the above quotations, that Proust inferred not that silver existed in a state of solution in the ocean, but that the silver abandoned at the bottom of the sea by shipwrecked vessels, does not remain in a metallic state, but changes to chloride of silver soluble in chloride of sodium, and that should the bed of the sea be changed to a continent, this precious metal would be found in that state. Moreover, the quantity of silver contained in the sea in a state of solution, caused by the ingots lost through shipwrecks changing to a state of chloride, must be too small to be perceptible, considering the vast extent of the sea itself. Messrs. Malaguti, Durocher, and Sarzeau, took quite a different view of the question, and prosecuted their inquiries accordingly. It being an established fact that silver is found combined with metallic minerals, these gentlemen inferred that it would be found in sea water. In fact, after repeated experiments, they proved that it did exist in the waters of the ocean, and they have succeeded in determining its approximate quantity, which is one milligramme of silver, to 100 kilogrammes of water. They have also found that silver exists in a small quantity in rock salt dug from the mines in the "department de la Meurthe," where it forms, as is well known, a marine deposit, composed of regular layers intercalated with variegated marls (clay chalks), from which circumstance these gentlemen entertain no doubt that silver existed in the antedeluvian, as well as in the actually existing seas. The presence of silver in the waters of the ocean must consequently be attributed to causes inherent to the physical elements of the earth, and independently of man's existence. Messrs. Malaguti and Durocher have shown that the existence of this metal in the waters of the ocean, may be accounted for in two ways. It is formed either by emanations of chloride of silver issuing from the bowels of the earth, or rather by the slow action which salt water exercises on the argentiferous sulphurs of the upper portions of the existing deposits (beds), either on the surface of the earth, or at the bottom of the sea.

Last year M. Tuld repeated the experiments made by Messrs. Malaguti Durocher, and Sarzeau, and has confirmed in a very interesting manner, the fact established by these chemists a few years since. Taking as the basis of his experiments, the action which a plate of copper exercises on chloride of silver dissolved in chloride of sodium, M. Tuld thought, that the copper and sheet brass with which ships are sheathed, after remaining in the sea, would contain silver. M. Tuld has, in fact, proved that it is so, in the case of the copper sheathing of a vessel which had been cruising seven years in the Pacific ocean. This copper was so arenaceous that it could be pulverised between the fingers. It contained more than one-half per cent. of silver. Another experiment was made on two samples of sheathing copper, one having been used three years in the Pacific ocean, the other having never been near the sea. The first contained eight times as much silver as the second. In a word, the silver in a state of solution in the waters of the ocean, represents a greater quantity than which man has been able to dig out of the bowels of the earth since the creation of the world. The substantial conclusion that M. Tuld arrives at is, that the ocean contains two millions of tons of silver, or two billions of kilogrammes. These are surely eloquent figures.

GRAFTON'S LOCOMOTIVE CULTIVATOR.

This machine has been invented for the purpose of carrying out the various processes of agriculture, from the ploughing of the land to the harvesting and carting of the crops, entirely by means of steam, without the aid of horses, and it is constructed expressely for travelling over every kind of soil, either across level fields, over rising ground, or up inclines of one in six, in a straight line. The machine is capable of doing all the operations of a farm with the same precision and with the same economy of labour and expense as if it travelled on permanent rails, as adopted in the guideway system, a system that can only be applied to large estates at a very considerable outlay and annual expense. The accompanying illustration is a perspective elevation of the locomotive cultivator which consists of a framework, with a series of broad driving wheels on each side, having air tubes or India-rubber cushions round the peripheries and travelling on a self-acting endless rail, on an entirely new plan. The framework is made chiefly of iron, and is fifty feet or more wide, so as to pass over and harrow, drill or hoe, the whole of that breadth of land at the same time, and to plough as great a part as the power of the engines employed will allow, without pressure or weight on the land under tillage, a very great advantage in tilling clay soils. It is made with a series of girders resting on, and at right angles to, the side trussed girders. These side girders form receptacles for the engines and boilers, and the supply of coal and water. By this arrangement the weight will be thrown to the lowest points of the machine, and space will be economized. The cross girders can be disconnected from the side girders, and the latter brought side by side, to facilitate the conveyance of the machine from one field to another, on the common road. All the implements to be used, whether ploughs, harrows, hoes, drills, reaping machines, or others, are suspended from the framework, and are of the ordinary construction, divested of wheels and shafts; they are fixed in frames running between the cross girders, and are capable of being moved from one side of the cultivator to the other. The carriage of crops or manure is effected by means of a frame, with a flat floor, suspended from the girders by iron straps within eighteen inches of the ground, or lower if suspended from the middle of the cross girders, without any supplementary trucks or waggons. This frame can be lowered to the ground, and by means of a pair of screws and lever nuts, raised again to the required height. The engines are not connected, and there is no occasion for them to be so, as both sides of the cultivator progress at the same rate, even if the engines be of different power, as no motion can take place on one side of the cultivator without its being communicated to the other side. If one series of wheels have to pass over any slight elevations or undulations, and so to traverse a greater length of land than the others, the velocity or revolutions of such wheels will increase accordingly; but both sides of the framework will still progress at the same rate, and continue an onward course without deviating from the straight line. The engines are fitted with reversing gear, and, by means of a clutch, may be used for other farm purposes, by disconnecting them from the propelling wheels. The series of broad bearing wheels, forms a very important part of the machine, each wheel being a driving or propelling wheel. They have air-tight tubes or cushions round the peripheries, filled with air or water, encased in very strong vulcanised India-rubber fabric, so as to give by the weight of the machine, a flat surface of equal pressure on the whole of the shoe of the endless rail. This equal pressure of the wheels by the flattened surface of the cushions upon the rail has the effect of closing up the openings or joints of the wooden shoes, and so giving a firm and rigid line of rail, which is further steadied by flanges on the driving wheels of the width of the shoes. The endless railway consists of a continuous belt of very strong India-rubber combined with flax threads, having wooden shoes about twelve inches by eighteen, shod with iron, fastened to it by a staple across the centre of each shoe, at right angles to the belt, which permits it to pass round the drums placed before and behind each series of wheels, and through the side girders under the engines. The rail is quite noiseless, and it has no mechanical or metal joints; the machines can be slightly but sufficiently guided when required, by the drums being moved to the right or left by means of a circular lever, which also guides the leading wheels. In front of the drums and driving wheels is a spade plough, similar to a scraper before a common locomotive, but of different shape, for the purpose of clearing a regular path and removing all impediments, to permit of the rails being laid down moderately even. The headland is laid down with rails to form a permanent and more convenient mode of taking the cultivator from the homestead to the field, or from field to field; they are twelve feet apart. The cultivator after it has traversed over, and operated upon, one stretch or breadth of land, is received on two beam trucks, and worked to the next breadth of land by means of radial arms, lowered from the engines, having at the ends propelling wheels. The headland rails have marks at every fifty feet, to serve as points from which the cultivator will start, from time to time, for the opposite side of the field. The land will thus be cultivated in strips of fifty feet, upon which no pressure, either of the cultivator or implements, will take place. The ploughs are right and left, and are suspended under the girders; they have a rack arrangement for raising and lowering them into working position. On the framework of the cultivator, a temporary cabin is erected for the use of the engineer and attendant, when far from the homestead, whose duties will be to take care of, as well as work, the machine, and an awning may be thrown over to protect the men from the heat of the sun or weather, when at field work.



BAROMETER INDICATIONS.

At the last meeting of the Royal National Life-Boat Institution, held on the 3d ult., in London, Captain Washington, R N., hydrographer to the Admiralty, called the attention of the committee to the desirability of erecting large barometer indicators wherever practicable on the coast, so that seamen and fishermen might be warned when in the harbour or offing, about two miles from the land, of a coming storm. Mr. Sopwith, president of the Meteorological Society, who takes great interest in the success of the barometer department of the Life-boat Institution's operations, exhibited at the meeting some fine specimen models of the proposed indicators. The institution decided that barometer indicators should, in the first instance, be placed in Northumberland, in compliment to his Grace the Duke of Northumberland, president of the society; also that one should be stationed at Wick in Scotland, and another at Arklow in Ireland. To carry out effectually this valuable suggestion a large sum would be required by the Institution, not only to fit up the indicators, but also to pay persons for carefully and permanently attending to them. When it is remembered that nearly 1000 persons annually perish from wrecks on our coasts every friend of humanity must rejoice in the establishment of any practicable plan for the mitigation of the fearful misery such a loss of live must cause in the homes of our seamen and others. A good barometer, if carefully watched, is an infallible indicator of a coming storm, and the day cannot surely be distant when a barometer can be made as portable as a pocket chronometer. Mr. Glaisher, F.R S , verifies each barometer of the Life-boat Institution by the Greenwich standard, and it was decided to request the members not to sell any instruments in its name which had not previously been so verified by Mr. Glaisher, who takes much trouble in performing this important but gratuitous duty.

OBTAINING ORNAMENTAL DESIGNS ON HORN, WOOD, AND BONE.

The following description of the process employed by Monsieur Cluzel for producing ornamental designs on horn, wood, or bone, will be interesting to our readers :—

The horn, wood, or bone is first brought to the desired shape and properly finished. A mixture sufficiently fluid for tracing or writing purposes is then prepared by slowly melting in a glazed vessel a small quantity of grease and olive oil, and the design is traced with a pen or an etching needle dipped therein. If the design requires shading, the tracing thus made must be allowed to cool, and the greasy matter be removed with an etching needle from such parts as require shading. When the design is completed, the horn, wood, or bone is covered with a composition consisting of one part of litharge and one half part of quick lime, tempered with urine, until it forms a kind of cream. This is allowed to dry in the sun or before a moderate fire, or even in the shade in a dry warm room, for three or four hours, according to the temperature. It must not dry too quickly, as too fierce a heat and too fast drying will cause the horn, wood, or bone to warp. A dry cloth is then used to remove the greasy tracing mixture and the covering composition, and the article is then re-polished in the usual manner, when the designs will become bright. White horn thus treated will form a good imitation of inlaid bone, or of ivory on shell. Transparent horn treated in the same manner will form a good imitation of inlaid mother-of-pearl, by placing beneath the design silver leaf, or an azure colour, produced from a mixture of white lead or zinc white, and indigo diluted in common oil. Gold leaf fixed with oil may be placed beneath the design. Designs of every tint may be produced on transparent horn by employing a well selected choice of colours.

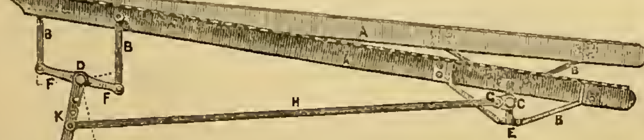
RECENT PATENTS.

THRASHING MACHINES.

William Tasker, *Waterloo Iron Works, near Andover—Patent dated May* 28, 1860.

The improvements specified under these letters patent relate to an improved mode of fitting and actuating the straw shakers used in combined thrashing machines.

The accompanying engraving represents a longitudinal side elevation,



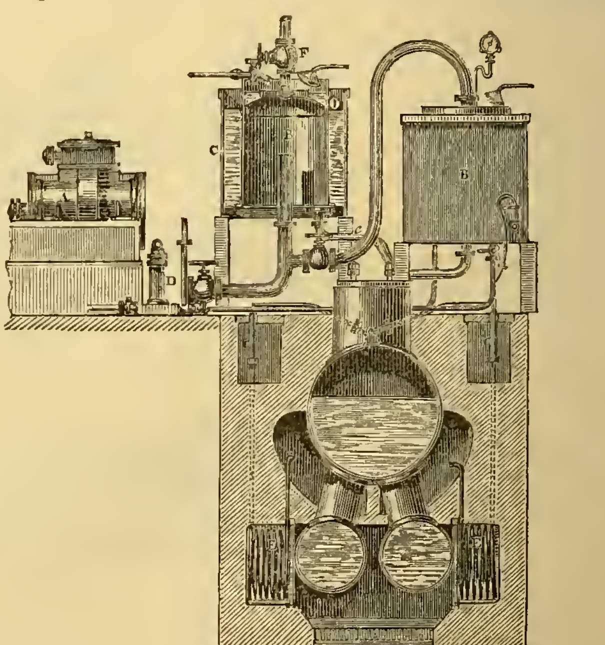
partially in section, of the improved straw shaker, with the supporting framing removed. A, are the shaker bars or frames, covered on the top with perforated metal, or otherwise constructed; and, B, are the arms and links through which motion is transmitted to these bars or shaking frames, from the two transverse shafts, C and D respectively. The shaft C, which is at the inner ends nearest the drum, is an ordinary rotating crank shaft, the arms, B, at this end of the shaker being connected directly to the cranks, E, whilst the shaft, D, which is merely a rocking shaft, is placed at the outer ends, provided with arms, F, which are fast thereon, and are connected by the links, B, to the outer ends of the shakers. A single crank, G, fast on the end of the rotating shaft, C, transmits a rocking motion to the shaft, D, through the rod, H, and arm, K, fast on the end of the rocking shaft. A number of holes are made in this arm, as shown in the engraving, or other suitable device employed, whereby the rod, H, may be connected nearer to or further from the centre of the rocking shaft at pleasure, so that the amount of vibration or rocking motion of such shaft may be increased or diminished as desired, and the consequent throw or action of that end of the skaker bars or frames adjusted to suit the nature of the straw.

REGENERATIVE ENGINES.

J. H. Johnson, *London and Glasgow* (M. Dalfoli & Co., *Paris*).—*Patent dated 30th Sept.*, 1859.

These improvements relate to a cheap and simple construction and arrangement of apparatus for re-working indefinitely the waste or exhaust steam of steam engines, and consists essentially in passing the waste steam through pipes which conduct it to two distinct receivers enclosed in water jackets or casings, constantly heated by a jet of steam, the water in the jacket of the second receiver being of a rather higher temperature than the first one. Here the steam experiences a slight condensation, and is then drawn out by two pumps, and forced in this state through two coils placed in flues near the furnace of the boiler.

Fig. 1 represents a partially sectional end elevation of the general arrangement of the apparatus above referred to, combined with a steam engine. The steam which has produced its effect in the steam



cylinder, A, passes by the exhaust pipe into the first cylindrical receiver, B, which is contained within a water bath, C, of a temperature of 85° centigrade. This temperature is regulated by a jet of steam obtained direct from the boiler, and by a jet or jets of cold water supplied by means of a pump through a rose jet, which directs the water on to the top of the receiver, whence it flows off by the apertures, O, into the bath, C; by this means the overheating of this portion of the chamber or receiver, B, is prevented. In this receiver the steam undergoes a partial condensation, which facilitates its expansion and escape from the cylinder, A. From this chamber the steam passes by the lower pipe, *c*, to the second chamber, E, enclosed by the bath, similar in every respect to the preceding apparatus. The water of this second bath is raised to a temperature of about 88° centigrade, that is to say, its temperature is rather higher than the first one, and by vaporising already the more or less watery particles form the starting point of the re-heating or re-generation of the steam. In this state it is rapidly drawn through the pipes by the pump, D, driven by the steam engine itself. The steam is thence forced along the pipes, *e*, to the two coils, E, placed near the furnace in a flue on each side thereof. Here it receives a considerable augmentation of pressure produced by the increased heat to which it is subjected, which heat is regulated by the dampers which intercept more or less the contact of the flame with the coils. At this point a jet of steam, conducted from the steam chamber of the boiler by the pipes and double stop-cock, is directed into the coils, and mixes violently with the surcharged steam therein, still further increasing its pressure and driving it along the tubes into the lower boilers, thereby producing a vacuum which effectually exhausts the steam from the body of the pump or pumps, and from the pipes or passages through which it has to travel. The steam is now in a condition to be again directed into the cylinder of the engine, where it re-operates upon the piston, and is subsequently submitted to the action of the regenerators again, thus being indefinitely re-worked without any additional cost of fuel or loss of force. The pipes are all provided with stop-cocks for regulating the admission and escape of the fluid or steam. The receiver, B, moreover, is furnished at its upper part with a pipe and cock, F, for the free escape of the steam when the apparatus is blown through for the expulsion of air therefrom. In this operation the working of the pumps, D, is not required, and therefore they are thrown out of action by slackening the pinching screw which connects at pleasure the pump rod with the rod of the eccentric. An indicator is fitted on to the receiver, B, to show the amount of vacuum produced in the apparatus, and a pipe serves to connect the inlet steam pipe directly with the bath, in order to raise the water therein to, and maintain it at, the desired temperature. Finally, this bath is provided at its lower end with a pipe and stop-cock, by the aid of which the apparatus may be cleaned out by introducing water forced therein by the pumps in lieu of steam, and by which the boilers may be filled at first starting.

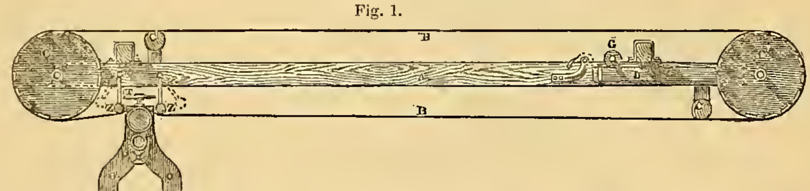
MANUFACTURE OF JAPANNED AND LEATHER CLOTHS.

HIRAM L. HALL, *Middlesex.*—*Patent dated April* 9, 1860.

THE improvements specified under these letters patent relate to a new system of applying colours, varnishes, and India-rubber, to cloth, leather, and other goods, whereby a considerable economy of time and material is effected.

Fig. 1 is a longitudinal vertical section of the machine taken along the centre line thereof. Fig. 2 is a plan corresponding to fig. 1. A, represents the main framing of the machine, and B, the fabric to be painted or coated, which is previously united at its ends so as to form an endless cloth, and in this form it is placed on the two drums, C and C¹. The framing which supports these rollers is made to overhang from the main supports, which extend from the floor to the ceiling, the stability of the overhanging portion being maintained by suitable stays and braces. The object of making the frame and drums overhanging, is to afford facility for the placing and removing of the endless cloth on to and from the drums without obstruction, which could not be effected were the framing supported at both sides by standards from the floor, without temporarily removing such standards. The axis of the drum, C, is carried in the two sliding bars, D, which are made to slide longitudinally into or out of the framing by means of the pinions, and gear into rack teeth formed on the bars, D. These pinions are carried by the transverse shaft, G, so that they both rotate together, and simultaneously actuate both racks when required. The shaft, G, carries a spur wheel which receives motion from a pinion fast on the short shaft, K. This shaft is also provided with a winch handle and ratchet wheel, the latter being held in any desired position by the detent. By turning the handle in the proper direction, the sliding bars, D, will be moved inwards, so as to bring the drum, C, nearer to the opposite drum, C¹; this admits of the endless cloth being easily slipped over the two drums, and when adjusted, it is tightened up or stretched by reversing the motion of the handle, which has the effect of forcing out or separating the drum, C¹, from its neighbour, and consequently of tightening or stretching the endless cloth over and between the two drums. The ratchet wheel and detent serve to maintain the cloth stretched until released for the purpose of removal. The painting or coating apparatus is carried by the separate standards, O, and consists of a colour trough, P, provided with a rotatory stirrer and colour roller, which dips into the colour and has its bearings in the ends of the colour trough, so that the whole may be moved out of the standards, O, when necessary. Above the colour roller is another roller or colour distributor, which works in vertically adjustable bearings carried in slots in the standards, O, such bearings being adjusted by the screw spindles and hand wheels, T, or other suitable contrivance, so as to cause this roller to press evenly and more or less forcibly upon the surface of the colour roller, the pressure being regulated according to the thickness of the coat of colour or other substance to be applied to the cloth. By screwing down the distributing roller so as to cause it to press firmly upon the colour roller, the amount of colour which it will receive from the other will be less than when the two rollers are only in slight contact with each other. A positive rotatory motion is imparted to the colour distributing roller by means of a spur wheel, fast on its axis, and gearing into a spur wheel on the axis of the drum, C. This drum is rotated by means of a winch handle on the fly wheel of a short first motion shaft, which through a pinion imparts motion to the spur wheel on the drum shaft, and consequently to the drum and to the colour distributing roller. By rotating the drum, C, a travelling motion is imparted to the endless cloth, B, which passes over, and in contact with the surface of the colour distributing roller, and receives a coat of colour or varnish therefrom, as the case may be. In order, however, that the colour or varnish may be more evenly spread on the cloth, a frictional or rubbing action is produced between the cloth and the roller by driving such roller either faster or slower than the endless cloth. The two rollers are geared together by small spur wheels, and the agitator or stirrer may be driven by a band from the spindle of the roller, so as to keep the contents of the trough well mixed. A pair of rollers, Z, are carried on moveable arms, the object being to keep the cloth, B, down upon the surface of the colour distributing rollers. When the cloth is to be removed these rollers are turned out of the way, as shown by the dotted lines in fig 1. *c*, are stretching rollers, so constructed as to keep the cloth well distended, or stretched laterally so as to prevent the formation of creases therein. If found desirable the fabric to be painted or varnished may be placed in the machine in the form of a web or open band, being wound off one drum on to another, and receiving its coat of paint or varnish as it passes along. In this case suitable means must be employed for keeping the coils or layers of newly painted or varnished fabric out of contact with each other, until they are sufficiently dry; this may be accomplished by inserting laths between each coil of freshly coated fabric, as it is wound on to the receiving drum.

Fig. 1.



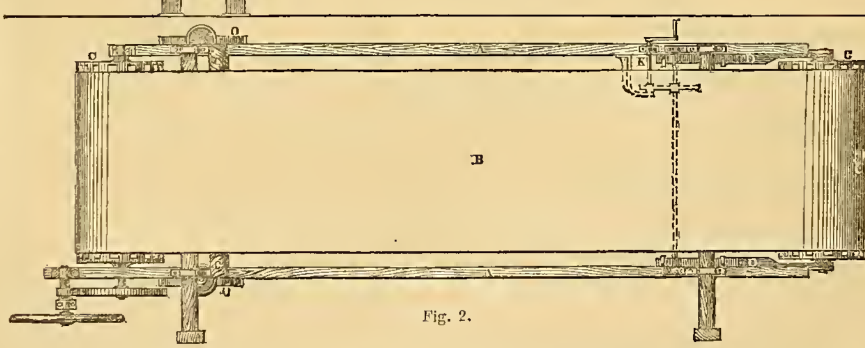


Fig. 2.

WATCHES OR TIMEKEEPERS.

J. H. JOHNSON, *London and Glasgow* (MERRICK PRICE, *Philadelphia*).—*Patent dated November* 8, 1859.

THE invention specified by the patentee relates to a peculiar construction and arrangement of watch or timekeepers, wherein an independent seconds hand is capable of being stopped or set in motion as desired, without in any way interfering with the ordinary train of wheelwork of the watch or timekeeper.

Fig. 1 represents a face view of an ordinary lepine watch, with part of the dial removed in order to illustrate these improvements; fig. 2 is a transverse section of a sufficient portion of the watch to show the parts of novelty; fig. 3 is an inverted plan view of the wheel from which the independent seconds hand derives its motion. A, represents the cover or dial plate of the watch; and B, the dial; the spindle which carries the minutes hand is driven in the usual manner. On this spindle is the usual "cannon" pinion, gearing into a wheel, F, on which is formed a pinion, gearing into another wheel, the latter being attached to or forming part of the hollow arbor, to the top of which is secured the hour hand, J; this hollow arbor turns in a tube projecting upwards from the plate or bridge, K, which is secured to the dial plate, and on this projection turns the hollow arbor, L, which carries the independent seconds hand, M; the arbor resting on the top of the bridge, K, and being prevented from rising by means of the stop arm, N, which will be more particularly alluded to hereafter. On the hollow arbor, L, are two collars forming a groove, in which is hung the wheel, P; the latter has two projections, *e*, on the under side, and to each projection is secured a spring, *f*, one spring bearing on one side and the other on the opposite side of the hollow arbor, L, as shown clearly in fig. 3. These springs form the only medium through which motion is communicated from the wheel to the arbor on which it is hung. The stop arm, N, has its fulcrum on a pin, *n*, screwed into the dial plate, A, and in the inner end of this arm is fitted the forked end, arranged over the hollow arbor, L, and which

Fig 1.

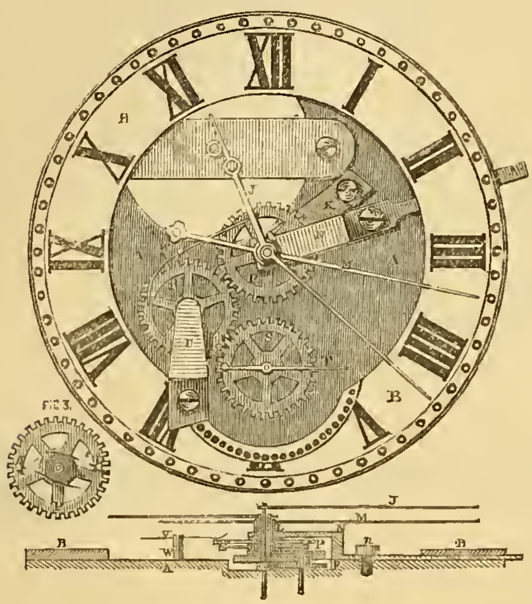


Fig. 2.

serves to maintain this arbor in its proper vertical position. A limited lateral play is allowed to the arm, N, so that when it is moved in one direction its forked end bears sufficiently hard against the hollow arbor to overcome the friction of the springs, *f*, against the said arbor, which is thus prevented from turning with the wheel, P. When the arm is moved in a contrary direction, the forked end ceases to bear hard against the arbor, which, thus released, is carried round with the wheels by means of the springs, *f*. The forked end of the arm, however, continues to perform the duty of maintaining the arbor in its proper vertical position, no matter what may be the position of the said arm. R, is a wheel turning in the bridge, U, on the dial plate, and this wheel gears into the wheel, S, which carries the ordinary seconds hand, T; V, is a spring secured to a stud, W, on the dial plate, one end of the spring bearing on the wheel, P, and the opposite end on the intermediate wheel, R. This spring by bearing on the two wheels obviates that rebounding or reaction, which would have a tendency to cause the seconds hand to rotate with an uncertain and irregular movement. The works which constitute the time train are similar to those of ordinary lepine watches; the minute hand, the hour hand, J, and seconds hand, T, being driven by the mainspring through the usual system of wheels and pinions. Watches have been heretofore furnished with independent seconds hands, which by suitable mechanism can be stopped and started without interfering with the regular movement of the time train; this end, however, has hitherto been accomplished by using a barrel and train of wheels independent of the usual time train, thus involving the necessity of complicated and costly works.

In these improvements the independent seconds hand, M, is driven by the usual time train, the stopping and starting of this hand being accomplished by the arm, N, in conjunction with the springs, *f*, on the wheel, P, which operate to accomplish the desired end without disturbing the movements of the time train.

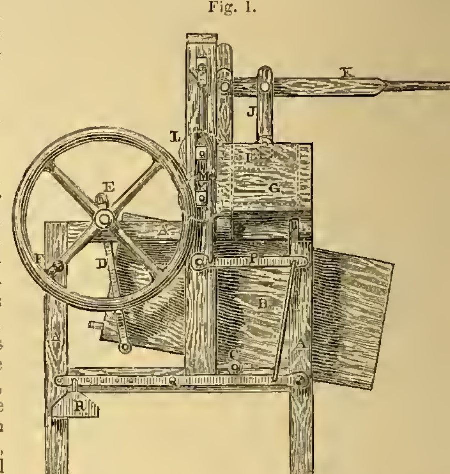
WASHING, WRINGING, AND MANGLING MACHINE.

Isaac James, *Tivoli Works, Cheltenham.—Patent dated June* 4, 1860.

This invention relates to certain improvements in the construction and arrangement of combined apparatus for washing wringing, and mangling clothes, and other textile fabrics generally.

Fig. 1 represents an end elevation of this improved combined washing, wringing, and mangling machine. Fig. 2 is a front or side elevation of the same, at right angles to fig. 1. A, represents the main framing of the machine; and B, is the washing vessel, which is provided with a lid or cover, B¹, seen only in fig. 1. The vessel is placed beneath the mangling rollers, and between the two end frames of the machine, supported upon a transverse bar, with pivots or stud centres, C, upon which it rocks or oscillates. One end of the vessel, B, is connected by the rod, D, to a crank on the driving shaft, E, which is provided with a fly wheel and winch handle, F, for the purpose of driving the machine. On rotating the winch handle, F, a rocking motion is imparted to the vessel, B, which effects the cleaning of the clothes contained therein, by the violent agitation of the washing liquid to and fro amongst such clothes. G, is the wringing box, provided at the bottom with a spout, H, for discharging the liquid which flows from or is expressed out of the articles being wrung or compressed, on the descent of the pressing plunger, I.

Fig. 1.



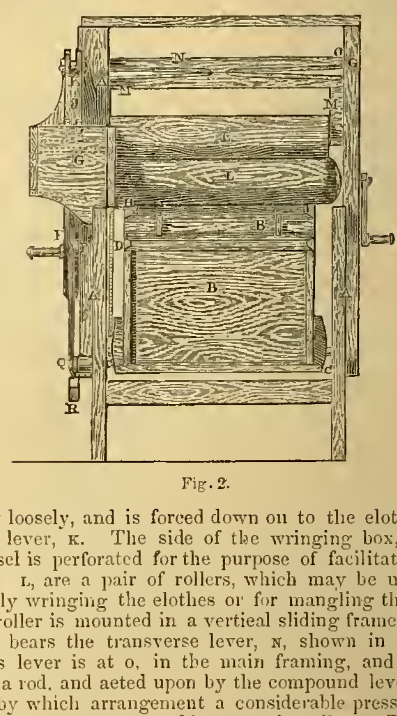


Fig. 2.

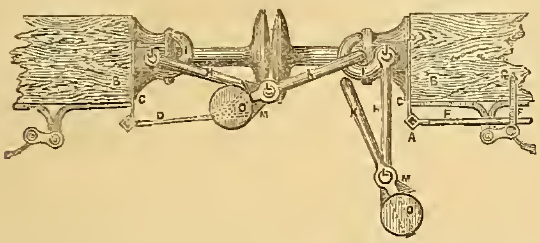
This plunger fits the box loosely, and is forced down on to the clothes in the box by the handle lever, K. The side of the wringing box, G, next to the washing vessel is perforated for the purpose of facilitating the escape of the liquid. L, are a pair of rollers, which may be used either for more effectually wringing the clothes or for mangling them afterwards. The upper roller is mounted in a vertical sliding frame, M, on the centre of which bears the transverse lever, N, shown in fig. 2. The fulcrum of this lever is at O, in the main framing, and its free end is connected by a rod, and acted upon by the compound levers, P and Q, and weight, R, by which arrangement a considerable pressure is exerted upon the clothes as they are passed between the rollers. This pressure may be increased or diminished by suspending the weight, R, from one or other of the holes in the lever, Q, as circumstances may require. There is a winch handle fast on the axis of the lower roller, whereby the requisite motion is imparted to it for the passage of the clothes between them.

COUPLING LINK.

Thomas Osborne, *Derby.—Patent dated August* 20, 1860.

One modification, specified under these letters patent, represents the patentee's improved coupling for railway carriages and other vehicles, whereby danger to life, incurred by the ordinary mode of coupling, is entirely obviated.

The annexed engraving represents a side elevation of the ends of two railway waggons divided with the improved coupling and uncoupling apparatus. A. is a transfer shaft fitted on the under side of the end sole, B, of the waggon, and working in hangers, C, secured thereto. The middle portion of this shaft is forged square, and fits into a corresponding square hole in the boss of the lifting arm, D. The ends of this shaft are also forged square for the reception of the square bosses of the actuating levers, E: these levers when not in use are retained in a horizontal position by the hooks, F, which are suspended from staples, G, in the sides of the waggon. The coupling itself consists of two straight links, H, connected at one end to each side of the shank of the draw hook, I, of the waggon by a pin, J, whilst their opposite ends are connected to the link, K, by means of the pin, L; this pin has two projections or catches, M, forged upon it at its middle, and its ends are squared or flattened and fit into corresponding holes in the link, K, so as not to turn therein. The coupling link, K, has its straight edges prolonged beyond the joint for the purpose of carrying the counterweights, O, which serve to keep the coupling in its proper position for being acted upon by the arm, D. When the operation of coupling is to be performed, each waggon may carry a similar coupling apparatus at each end, if



desired, and when two are coupled together the link which is out of use remains suspended in a vertical position, as will be seen on referring to the engraving. In coupling a pair of waggons by the aid of this apparatus, the handle, E, is depressed, which has the effect of raising the arm, D, and bringing its extremity under the nose of the catch, M, and against the links, H, thereby raising the links, H, into a horizontal position, whilst at the same time by its pressure on the catch, M, it gradually extends the coupling link, K, which is thus brought over the opposite draw hook, and then allowed to drop therein. In order to uncouple the waggons, the arm, D, is again raised until it bears against the under side of the links, H, and nose of the catch, M, the raising of the arm being continued until the coupling link is lifted clear of the draw hook, by which time the nose of the catch, M, will have been released from the end of the lifting arm, D, when the coupling link will be tipped up by the counterweights, O, into a vertical position, in which it will remain suspended, on the descent of the links, H. Although a single balance weight would answer the purpose, yet the patentee prefers to use two, as they tend to keep the coupling more perpendicular and better up to its work.

In existing waggons having the ordinary couplings, another modification of this invention may be employed with a view to economy of material. In this case a stud is welded on to each side of the end coupling link, having one end of a jointed or single lever working loose on it, the other end of this lever being lifted by the lifting arm or lever on the shaft.

PURIFYING LEAD.

William Baker, *Sheffield.—Patent dated June* 21, 1860.

This invention relates to a peculiar process for effecting the purifying and the softening of hard or impure lead. Lead, as it occurs in commerce, frequently contains a number of impurities, consisting principally of sulphur, antimony, arsenic, iron, and other metals, the presence of which greatly impairs its softness and ductility. The object of the patentee's invention is to remove these impurities and to soften and purify the lead, and this he effects by the admixture of oxidising agents with the lead when at a temperature higher than its melting point. The agents which have been found most efficacious are the nitrates and the bi-sulphates of soda and potash, but other salts, which at a high temperature act as oxidising agents, may be advantageously employed, such as sulphate of iron, a mixture of bi-sulphate of soda or potash with common salt or chloride of sodium, the hypochlorates of lime, soda, and potash, the chlorates of potash and soda, or a mixture of any of the above-named salts or compounds. These salts or mixtures of them may be used either in a state of division or in a fused or fluid condition, and when employed in either condition, are to be incorporated with the molten lead contained in a suitable pot or vessel by means of a ladle or other convenient instrument. Upon such admixture, the oxidised products and impurities will rise to the surface, and may be skimmed off. The lead having been so treated will be found to be both purer, softer, and better capable of being rolled or worked. The proportions of the oxidising agents employed depend, of course, on the amount of impurity existing in the lead. The patentee has found that in the treatment of impure lead, such as that known as English flag lead, and to which his process is more especially applicable, that the following proportions may successfully be employed. When the nitrates of the alkalies are employed, they are used in the proportion of one part by weight of the dry salt to every 100 parts by weight of lead. In subjecting the impure lead to the action of the bi-sulphates of soda and potash, they are used in the proportion of two parts by weight of either of the bi-sulphates of potash and soda to every 900 parts by weight of lead. The hypochlorates before-mentioned, or sulphate of iron, or mixture of the bi-sulphates of potash or soda with common salt, are used in the proportion of three parts by weight to every 100 parts by weight of lead. Although the patentee has found these proportions to effect the softening of certain classes of hard flag or impure lead, he does not confine or restrict himself to any of the before-mentioned proportions.

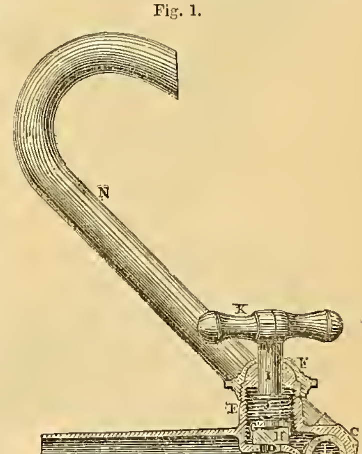
STOP COCKS.

Andrew Strathern & Sons, *Brassfounders, Glasgow.—Patent dated July* 13, 1860.

Under these letters patent is specified improvements in stop cocks or valves for regulating the flow of fluids.

Fig. 1 of the accompanying engravings is a partially sectional elevation of one modification of these improvements, and fig. 2 is a plan of the same, corresponding to fig. 1. The improvements are shown as applied to an ordinary tube-cock, or "swan neck," so as to obtain an effectual control over the flow of the water, and to prevent, at the same time the enormous waste of water which cannot be avoided with the ordinary arrangement of tube-cocks. The inlet portion, A, is cast of the usual T, shaped figure, the stem of which is soldered or otherwise attached to the water service pipe. This tubular portion of the cock is cast with a horizontal diaphragm, B, which is arranged at the outer end of the tubular part, A, and immediately behind the laterally projecting portion, C, which forms the extremity of the T shaped inlet part. The diaphragm, B, has formed in it the valvular opening, D, the upper surface of the diaphragm forming the valve seat. Above the diaphragm, B, the metal of this part of the cock forms a vertical tubular part, E, the front part of which does not, however, extend quite down to the valve seat, B, so that there is a passage for the water from the opening, D, through into the tubular part, C. The inner surface of the tubular part, E, is screwed throughout its length, and an external screw is also formed at the upper part to admit of the cap, F, being fitted thereto. The cap, F, is of a convex figure on the upper part, in which a circular opening is formed; the interior of the cap is lined or fitted with India-rubber or other suitable elastic material. The tubular opening, E, thus arranged, forms a chamber for the regulating valve, G, which is recessed to receive the India-rubber disc, H, the pressure of which on the diaphragm, B, stops the flow of water through the cock.

Fig. 1.



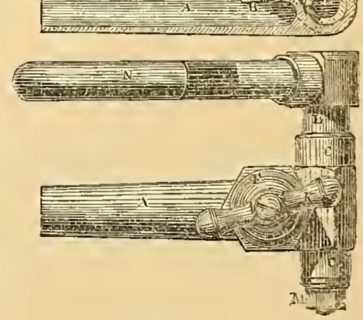


Fig. 2.

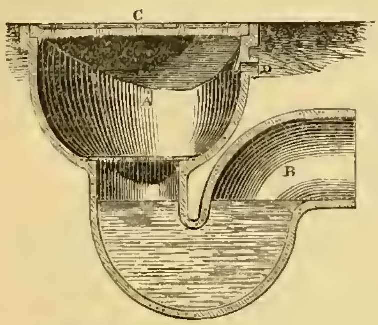
On the spindle, I, of the valve, G, a metal boss, J, is formed, which part is screwed to correspond to the internal screw of the valve chamber, E. The spindle, I, of the valve passes out through the cap, F, and terminates in the cross head, K, which forms the handle for actuating the valve. In the tubular part, C, of the inlet portion of the cock is fitted the tube, L, this tube is slightly conical, and it is secured by means of the nut, M. The other extremity of the tube, L, carries the curved tube or swan neck, N, through which the water flows into the vessel to be filled. An opening is formed in the tube, L, as shown at O, fig 1, to admit of the water flowing through the tube, L, and out by the swan neck, N. In this way, when the valve, G, is down, as shown in fig. 1, it is immaterial whether the tube, N, is up or down, as no water can pass the valve, and the pressure of the water being confined to the surfaee of tbe disc, H, leakage at the ends of the tube, C, is wholly avoided. The arrangement of the valve, G, admits of the flow of water heing let on gradually, the force of the outflowing stream being under perfect control by means of the screw, J. So that as the valve is raised gradually by the rotation of the handle, K, the water is eaused to flow from tbe mouth of the swau neck with any required degree of force, and in any required direction within certain limits, according to the position of tbe swan neck, N, and at the same time, without splashing or the great waste of water, caused by tbose cocks now in use. As the pressure is taken off from the tube or key, L, and cock, C, their ground surfaces do not require to be kept so accurately fitted, or so tightly screwed up as with those of the ordinary construction.

DRAIN TRAPS.

ROBERT HYDE, *Kirkley.—Patent dated June* 12, 1860.

THE improvements specified hy the patentee relate to a peculiar construction and arrangement of trap drain for draining stables and similar places, whereby a free and entirely unimpeded thoroughfare for the drainage is provided, whilst at the same time the rising of effluvia from the drain is prevented. According to this invention, it is proposed to employ a suitable hox or drain pot, which is let into the stable floor, flush therewith, and is connected to a syphon or S pipe, whieb forms the trap and drain pipe leading to the sewer. The box and S pipe may be constructed either in one piece or separately, and eomposed of earthenware or cast-iron. A perforated plate, in lieu of the ordinary grating, is fitted on to the top of the drain box or pot, aud in places where water is not laid on, or when the fall is not great, an inner and finer perforated plate may be introduced into the bottom of the box or pot at the mouth of the syphon pipe, for the purpose of preventing tbe entrance of chaff and small refuse matter into the pipe. The upper perforated plate has cross channels or grooves cast in its surface, to afford a better foot hold to the horses, and prevent them from slipping. For the facility of flushing these drain traps, the patentee proposes to connect a service pipe to the side of each of the boxes or pots, a cock being provided, by which water may he turned on, and the whole series of drains flushed simultaneously. The subjoined figure represents a longitudinal vertical section of the patentee's improved stable drain, showing the perforated and grooved metal plate wbieh forms the eover of the drain box or pot. A, is the drain hox, which is represented as cast in one piece, with the S pipe or syphon trap, B, although it may be made in a separate piece, and connected in the usual manner to the trap. C, is the top plate or eover provided with holes to allow the drainage to pass through, and having cross grooves or channels cast in it so as to form a hetter foothold for the horses. If desired, a smaller or finer perforated plate or grating may be inserted at *a* (but in most cases this will not be found necessary), to prevent the entrance of chaff and other refuse into the drain. D, is an inlet used in flushing the trap, each separate trap being connected hy a branch with a service pipe provided with a stop cock, so that on opening the cock, the whole of the boxes and traps may be flushed and thoroughly cleansed simultaneously.

Fig. 1.



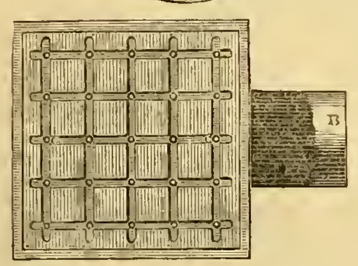


Fig. 2.

PRESERVATIVE COMPOSITION FOR IRON AND WOOD.

JOHN PILE AND J. R. SMYTH, *Hartlepool.—Patent dated July* 14, 1860.

MR. J. PILE, whose ingenious arrangement of a floating dock, we illustrated in the *Journal* for Oct., 1859, has, in conjunction with Mr. J. R. Smith, obtained letters patent for a composition suitable for preserving the surfaces of iron and wood from oxidation and decay. This composition is specially applicable for the preservation of the surface of iron ships, buoys, reservoirs, gas, water, and other metal pipes. Also to the preservation of wooden surfaces, such as the exterior of the bottoms of wooden ships, railway sleepers, piles, wooden buoys, and the wooden foundations of piers, and other structures. In carrying out this invention the patentees first apply to the surface to be protected a preparatory coating of red composition consisting of a mixture or combination of litharge, venetian red and pine varnish. They have obtained good results by using these ingredients in the following proportions, but they do not confine themselves strictly thereto: litharge one pound; venetian red one pound; pine varnish, one gallon. Over this coating when dry is next applied a coating of composite enamel consisting of the following ingredients in the following proportions, which proportions may, however, he varied more or less, hut a good effect will be obtained from those here below. Take of black pitch, resin, asphalt, or any pitchy or bituminous substance, equal parts, by weight, and add thereto say 20 lbs. of coal tar or oil to every 112 lbs. of enamel. In practice when treating surfaces with these compositions the patentees first apply, the red composition before described, and then pour over such surface a layer, or eoating of the eomposite enamel, in a hot lava state, or when praeticable they plunge or immerse the surfaces to be preserved in the melted enamel, o, apply it thereto with a brush.

LAW REPORTS OF PATENT CASES.

CHENILLE AND PILED FABRICS.—DAVENPORT *v.* RIEKARD.—This was a motion in the Vice-Chancellor's Court, before Vice-Chancellor Sir W. Page Wood, for an injunction to restrain the defendant from using certain inventions for the manufacture of "chenille" and other piled fabrics. for which they had obtained patents, on the ground that they were thereby infringing the plaintiff's patent for such manufactures, originally obtained in 1851, and supplemented by further letters patent for fresh improvements, and for obviating existing objections, obtained iu 1857, these patents having become vested in the plaintiff by assigument. The defendants had obtaiued in the present year a patent for improvements in the manufacture of chenille, the specification being filed iu August last. The plaintiff alleged that by a eomparison of the specification of the defendants with that of the plaintiff the processes were shown to be substantially identical, and had filed this bill to restrain the infringement alleged to be committed by the defendants in the exercise of their process.

The details of the respeetive processes were very complicated, and could scarcely he rendered intelligible without the aid of models or diagrams.

For the defendants it was eontended that the specification of the plaintiff was bad for want of certainty, and as being too wide, and not sufficiently distinguishing that which was new from that previously in use. They also contended that the alleged infringement was not proved, and that the plaintiff bad not established his title by registration.

The Vice-Chancellor said that the question was whether there was such a strong *primâ facie* case on the part of the plaintiff as to justify the Court in granting an *interim* injunction until the title of the plaintiff had heen determined upon at law. Where there had been long-continued enjoyment by a plaintiff, even though his right might be not entirely free from doubt, the Court would protect him until the trial. Where, as here, there had been long enjoyment, and a *primâ facie* case was made out, the hardship would be evidently upon the plaintiff in refusing rather than upon the defendant in granting the injunction. As to want of registration, the patent was assigned to the plaintiff in 1852 (the year in which the Act was passed), and he might have acquired a title before the passing of the Act, though there had been no subsequent registration. The process covered by the plaintiff's patent had entirely superseded all the older methods of manufacturing "ehenille," which were of a very cumbrous nature. The plaintiff had derived, and was entitled to, great profits from the invention, of which for a long period he had been in undisputed possession. Its usefulness and novelty were beyond doubt, and although various objections were taken against tbe patent, which no doubt would have to be submitted to and might have weight with a jury, he was not for himself satisfied that any of these objections were so conclusive as to deprive the plaintiff of his right to protection in the meantime until the defendants had established a right to use such an approximate invention. There must be an *interim* injunction, the plaintiff undertaking to commence his action forthwith, so that the same might be tried in London.

THE RANGOON AND SINGAPORE ELECTRIC CABLE.—At the Court of Chancery on Saturday, *in re* Newall *v.* Elliot was considered. The case was au appeal from a decree of Vice-Chancellor Page Wood granting an injunction restraining the infringement of the plaintiff's patent for paying out submarine electric cables, and the sailing of the steamers, *Queen Victoria*, *Rangoon*, and *Malacca*, with the Rangoon and Singapore cable on board. The Lords Justices, after a lengthened judgment, dissolved the injunction, leaving the plaintiff to proceed by action for the alleged infringement, and, if maintained, the Court to make an order.

FURNACES: PRIDEAUX *v.* DARBY.—This was an action in the Court of Queen's Bench, Westminster, before Lord Chief Justice Cockburn, and Justices Crompton and Hill. Mr. Knowles, Q.C., moved for a rule to show cause why the verdict entered for the plaintiff in this case should not be set aside, pursuant to leave reserved at the trial. The action was brought to recover damages for the infringement of a patent granted to the plaintiff in the year 1849, for "improvements in puddling and other furnaces, and in steam boilers." At the trial, which took place before Mr. Justice Crompton in this court, at the sittings after last term, it was arranged that all the facts should be referred to the decision of the Court.

According to the plaintiff's specification the peculiarity of his invention consisted in the employment of air under pressure, caused to circulate through suitable passages or ways, to become heated, and then to pass into a closed ashpit, by which the fire would be supplied with heated air, propelled through the passages by means of suitable blowing apparatus. By those arrangements not only did the air cool down the bottom of the puddling furnace, but also the bridges, and, becoming highly heated, aided materially in supporting combustion; but, he said, he did not claim the causing air to be heated in that manner, the novelty consisting in the use of air forced through heating surfaces, and into a closed ashpit of a puddling furnace. The plaintiff claimed the improvements in puddling furnaces, and also mill or scrap furnaces, by the employment of closed ashpits in combination with air under pressure, as above explained; but he afterwards entered a disclaimer of all that part of the title of his patent which related to "steam boilers."

Lord Chief Justice Cockburn said, that as there must be a rule, it would be unnecessary for the learned counsel to state the facts at the present time.

Mr. Knowles said he would put all his points into the rule.—Rule *nisi* granted.

COILING CANS: PLATT *v.* HOWARD AND *al.*—This action, which was tried in the Civil Court at Liverpool, before Mr. Justice Blackburn, was brought for the infringement of a patent for coiling slivers of cotton in receiving cans, the slivers being loose lengths of cotton formed by the carding or drawing machines. The patent was granted to James Houghton, and assigned to Platt Brothers, the great machine-makers of Oldham. It appeared that the great merit of the invention lay in the employment of a tube, which was fixed in a slanting direction on the top of the cover of the receiving can. The cover was made to revolve, and the sliver, being delivered into the upper end of the tube, in the centre of the cover, passed through the tube and out through the lower opening at the edge of the cover. By this apparatus the sliver is coiled into the receiving cans in a helical form, and very large quantities of the cotton are coiled or packed in a small space, at the same time that it is in the most suitable form for being afterwards withdrawn, and operated upon by the various twisting and spinning machines to which it is subsequently conveyed.

At the close of the plaintiff's case, various points of law were made by the defendant's counsel, and were reserved by the judge. Witnesses were then called for the defendants, who gave evidence that the invention was not in fact invented by the patentee, Houghton, but by one Richard Hardman, and farther, that the invention was publicly used in two or more cotton mills in Lancashire prior to the date of the patent. After the defence had been proceeded with for some time, certain overtures were made on behalf of the plaintiff, which terminated in a juror being withdrawn, and the case was therefore concluded without any verdict being found.

LAYING TELEGRAPH CABLES: NEWALL *v.* ELLIOT—This was a motion in the Court of Chancery, Lincoln's Inn, before the Lords Justices of appeal, to dissolve an injunction granted by Vice-Chancellor Wood on the 5th of December. In the judgment the Vice-Chancellor said that if the defendants' apparatus had been adopted only for the purpose of packing the cable, there would have been no infringement, the plaintiff's patent being "for more easily paying out the cable." But as in the description given of their process they could not say that the central core or support did not assist the unwinding of the cable, the plaintiff was entitled to the injunction, as this was what the plaintiff's patent gave a facility of obtaining. One of the main features in the affidavits filed by the defendants was, that the internal cylindrical support of the coil of cable, by means of the upright beams, was only resorted to for the security of the coil during the voyage; and that during the paying out of the cable those upright supports must be cut down from time to time, they being always kept a few inches below the top of the coil. They also swore that "kinking," or twisting, of the cable was only prevented by the employment of many adroit hands in the process of paying out. To this Mr. Newall, the plaintiff, swore that, even if the cylinder were, from time to time, cut down during the paying out of the cable below the top of the coil, it would materially assist the successful laying down of the same, and obviate the tendency to kink, from its having the effect of retaining the bulk of the coil in a firm and compact position, although all the benefit of his entire patented invention would not be obtained without the apex, or top, to the cylinder or cone, or some equivalent.

It was stated that the contract for the cable involved a sum of £500,000, that the cable on board the ships restrained from sailing was 1,500 miles in length, and that the cost caused by the stoppage of the ship was no less a sum than £500 a-day; and also, that if any great further delay should take place the ships will be seriously interfered with by the prevalence of the monsoons in the China seas.

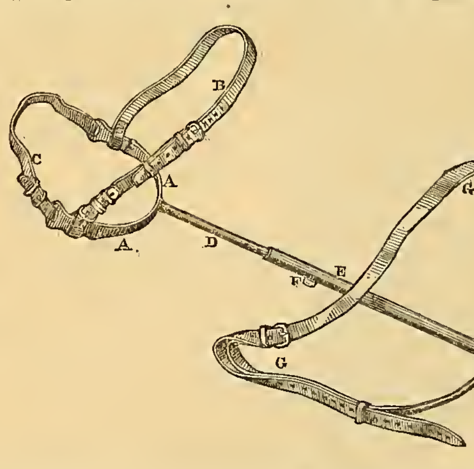
COUNTERFEITING TRADE MARKS.—The following incident bearing upon the really important subject of trade marks may very fitly be appended to our law reports proper. A large wholesale customer from London walked into the warehouse of one of our leading button manufacturers. A member of the firm who was in attendance held out his hand for the friendly greeting that usually preceded business negotiations. To his great surprise this was indignantly refused. The customer than threw down a parcel of buttons, asking the manufacturer whether they were not made by him. The buttons, the card on which they were placed, and the papers in which they were wrapped were examined, and the name of the firm was found to be stamped on the back of the buttons; the name and a sort of escutcheon used as a trade mark were printed on the wrapping paper, which was of the same colour and quality as that used in the manufactory. The customer then explained the cause of his indignation; he had purchased those at 10 per cent. under the prices he had been paying directly to the manufacturer, whom he accused of a breach of faith in supplying other dealers at a lower price. This was at once denied, and the manufacturer offered to show his books in proof of the denial. A further examination of the buttons was made; some were pulled to pieces, and then it was seen that they were only imitations of the articles they were supposed to be—that they were of inferior quality in everything but external appearance; but the imitation was so close that the manufacturer himself was at first deceived by them. Further investigation proved that the buttons were imported from the continent, and that they were probably made in Belgium.

REGISTERED DESIGN.

CRIB-BITING AND WIND-SUCKING PREVENTER.

Registered for JOHN CASSIDY, *Dublin.*

THE purpose of utility to be secured by the shape or configuration of this design is the prevention of "crib-biting" and "wind-sucking" in horses. The engraving represents a view of this apparatus complete. A, is a fork joined at the sides and intended to rest under the horse's chin, being retained in that position by a strap, B, passed over his head,



and another strap, C, over his nose. The shank, D, of the fork is capable of elongation, being made telescopic in the tube, E, and fixed in any position by a set screw, F. The lower end of the shank is supported in the centre of the horse's chest by a strap, G, which is passed round his neck at the shoulders.

The whole of the parts of this design, as here combined, are registered as novel and original in shape or configuration.

STEAM HAMMER FOR GENERAL PURPOSES.

By MR. R. MORRISON, *Ouseburn Engine Works, Newcastle-upon-Tyne.*

(*Illustrated by Plate* 266.)

THE steam hammer represented in plate 266, is adapted to meet the requirements of a considerable range of work. The compactness and solidity of the framing, as well as the powerful character of the hammer, renders it suitable for the heavier kind of work, whilst, from the ease with which the valve gearing is manipulated, renders it exceedingly handy and efficient in the lighter class of forgings. On the sole plate, A, the cast-iron standard, B, which forms the framing of the hammer, sweeps upwards in a curved figure from the broad and substantial base. The upper part of the standard slightly overhangs the base, its vertical face being in a line with the anvil block, C. The cylinder, D, is bolted to the face of the standard, B, the piston-rod which also forms the hammer bar, E, works out through the stuffing-boxes in the end covers of the cylinder. The bar, E, carries at its lower extremity the steel hammer, F, which descends on to the anvil, G. The necessary supply of steam for working the hammer, flows up through the steam pipe, H, to the slide valve chest, I. The flow of steam through the pipe is controlled by a throttle valve, which is actuated by the handle, J, this handle has a laterally projecting stud, and by means of a nut, may be fixed in any desired position in the contiguous slotted quadrant. The exhaust steam passes off down the pipe, K, which is arranged parallel to the steam-pipe, H. The slide valve is actuated by the piston-rod or hammer bar, E; the vertical reciprocatory movement of which moves the curved link, L, to and fro. The lower end of this link forms a bell-crank lever, the horizontal extremity of which is connected by means of duplex links to a small cross head, M. The spindle, N, of the slide valve, passes up through this cross head, and is retained by means of a pin to admit of its turning freely about its axis. The lower end of the valve spindle, N, works out through a stuffing-box in the lower part of the valve chest, I. At the lower part of the spindle, F, is fitted a wheel which gears with a corresponding wheel on the upper extremity of the hand lever, P. The boss of the wheel on the valve spindle, N, works in a bearing carried on a bracket, formed at the back of the standard, B. A laterally projecting arm on the bracket serves also for the upper bearing of the spindle of the hand lever, P. A feather is formed in the valve spindle, N, so that when the hand lever, P, is turned round, the valve spindle, N, is turned on its axis, and the position of the slide valve is adjusted by means of the nut and screw on the back of the valve. The arrangement of these valves is fully described and illustrated at p. 178 in the *Journal* for October last. In front of the slide valve is a secondary valvular arrangement; this consists of a gridiron valve which works up and down in contact with the steam and exhaust ports of the cylinder. The lower part of this valve is connected by means of a link to the upper extremity of the hand lever, R, which passes through a slot in the tubular bearing of the wheel on the valve spindle, N. The hand lever, R, extends downwards within convenient reach of the attendant, and is fixed in any desired position, to the slotted segment, S. By means of the valve connected to the hand lever, R, the admission of steam to the cylinder may be partly or wholly shut off, and by the same means the flow of steam through the exhaust may be checked, or entirely shut off, so as to confine it within the cylinder. The exhaust pipe is also fitted with a throttle valve, which affords the means of controlling the egress of the steam with the greatest nicety. The several arrangements, place in the hands of the attendant operator, all that can be desired in the way of effective, yet delicate manipulations.

MECHANIC'S LIBRARY.

Engineer's, Architect's, and Contractor's Pocket Book. 1861. 6s.
Exact Science as applied to History, crown 8vo., 2s., boards. Kingsley.
Industrial Resources (still neglected) in Ireland, 2s. 6d. Crory.
Infusoria, History of, 4th edition, enlarged, 8vo., 36s., cloth. Pritchard.
Invention and Discovery, Triumphs of, post 8vo., 3s. 6d , cloth. Fyfe.
Spherical Astronomy, translated by Main, part I. 8s. 6d. Brunnow.

REVIEWS OF NEW BOOKS.

STEAM BOILER EXPLOSIONS. By Zerah Colburn, of New York. 8vo. Pp. 60. London: Weale, 1860.

AN American engineer has come forward to discuss a momentous question which has latterly, at any rate, been perhaps too much neglected by British engineers. Much of the matter here given has appeared in print before, in scattered portions. It is now extended and reduced to a usefully readable form.

"A well-made steam boiler," says the author, "cannot be burst or torn open except by a great force. The internal pressure required to rend open a cylindrical boiler may be approximately calculated for any size of boiler and thickness of plates. With a boiler 3 feet in diameter, and 10 feet long, the plates, if $\frac{3}{8}$ inch thick and riveted in the ordinary manner, oppose at least $65\frac{1}{2}$ square inches of resisting section to any pressure tending to burst the boiler longitudinally open, or in the direction of its least resistance. A section of $65\frac{1}{2}$ square inches of iron, of average quality, would not yield under a tensile strain of much less than 1,462 tons (the resistance of the iron being taken as 50,000 lb. per square inch), and this amount of strain could not be exerted by the steam within a boiler of the assumed dimensions, except at a pressure of at least 758 lb. per square inch. Such a boiler, therefore, if worked at a pressure of less than 125 lb. per square inch, would appear to be beyond all danger of explosion."

Here is apparently margin of strength enough to lead to the general supposition, that some extraordinarily violent internal action takes place at the interval preceding the actual rupture of a steam boiler. Now, without either accepting or rejecting the theory of explosions on the ground of steadily accumulated pressure, the author proceeds to consider the several theories which have been brought forward in the matter, such as the sudden production of great quantities of steam from water thrown upon red-hot plates; electrical action; the decomposition of steam, and detonation of hydrogen in contact with air. To this list might be added scores of other fancies which have entered the heads of those who have thought, or attempted to think, upon the subject; but what we have enumerated are those which Mr. Colburn takes in hand.

CORRESPONDENCE.

EXPANSION BY HEAT.

IN your last number I find a communication from Mr. Paul Cameron, "On the expansion of metals and fluids," on which I beg to offer some remarks, inasmuch as we are directly at issue on some important points, respecting the communication of heat, and which, as stated by him, are incompatible with the views urged by me in my treatise just published, on "Heat in connection with Steam." In that communication Mr. Cameron has given the results of some experiments made with great care, and aided by some well-defined illustrations. After experimenting on different metals, and "finding the results similar in all," he observes: —"I inferred that the fluids would follow the same law. The fluids experimented on were mercury, oil, and water." Now here was an inference wholly unwarranted. To compare a liquid formed of numerous separate particles or bodies in constant motion among themselves, and without any heat conducting power, as admitted by all chemists, with metallic bodies whose particles adhere so strongly as to prevent any motion *inter se*, and all of which have strong conducting properties, was surely unwarranted, and at best is at variance with his own introductory remark, namely, that "he should proceed on clearly experimental deductions, leaving as little to speculate therein as possible."

After some clearly expressed details of experiments on metallic bars, he continues:—"In order to verify the above important experiment, I procured a large mercurial thermometer, the bulb being $2\frac{1}{2}$ inches in diameter, and its length 10 inches. This thermometer, together with an ordinary one were fixed in the apparatus," namely a boiler filled with linseed oil, and made to act the part of a pyrometer by a small float resting on the mercury. He then adds, "when the lamps were lighted the mercury immediately indicated contraction by the pyrometer, while the other thermometer was rising slowly, till about 335° Fahrenheit, and thereafter decreased in a proportionate ratio. The lamps were removed when the thermometer indicated 600°, and still the mercury continued to expand, thus confirming the former experiment."

A similar experiment was then made with a water thermometer, 3 inches in diameter, the bore, $\frac{1}{4}$ inch, and the stem, 12 inches long. He then continues, "when the thermometer was fixed in the water, the temperature was 42°, and that of the room, 57°, the lamps were then lighted. The water gave the same indications as that of the mercury, *i.e.*, contraction when the heat was applied, and expansion when the lamps were removed." Mr. Cameron then adds: "the question now comes to be, what are the causes which produce *contraction* when heat is applied, and *expansion* when it is removed. On this we can only offer one opinion, that is, that if we accept the mechanical theory of heat it may be explained in this way, that the particles arrange themselves in a particular way when expanding, and re-arrange when contracting, and it is the particles so arranging themselves, if we conceive them to be of a prismatic, triangular, or oblong form, which causes expansion or contraction."

The solution of the difficulty here so ingeniously and gratuitously raised, is, however, so manifest, that it seems strange so accurate an observer should have overlooked it, and I have no doubt, Mr. Cameron

Plate. 266.

STEAM HAMMER.

R. MORRISON,

OUSEBURN ENGINE WORKS,

NEWCASTLE-ON-TYNE.

Fig. 1.

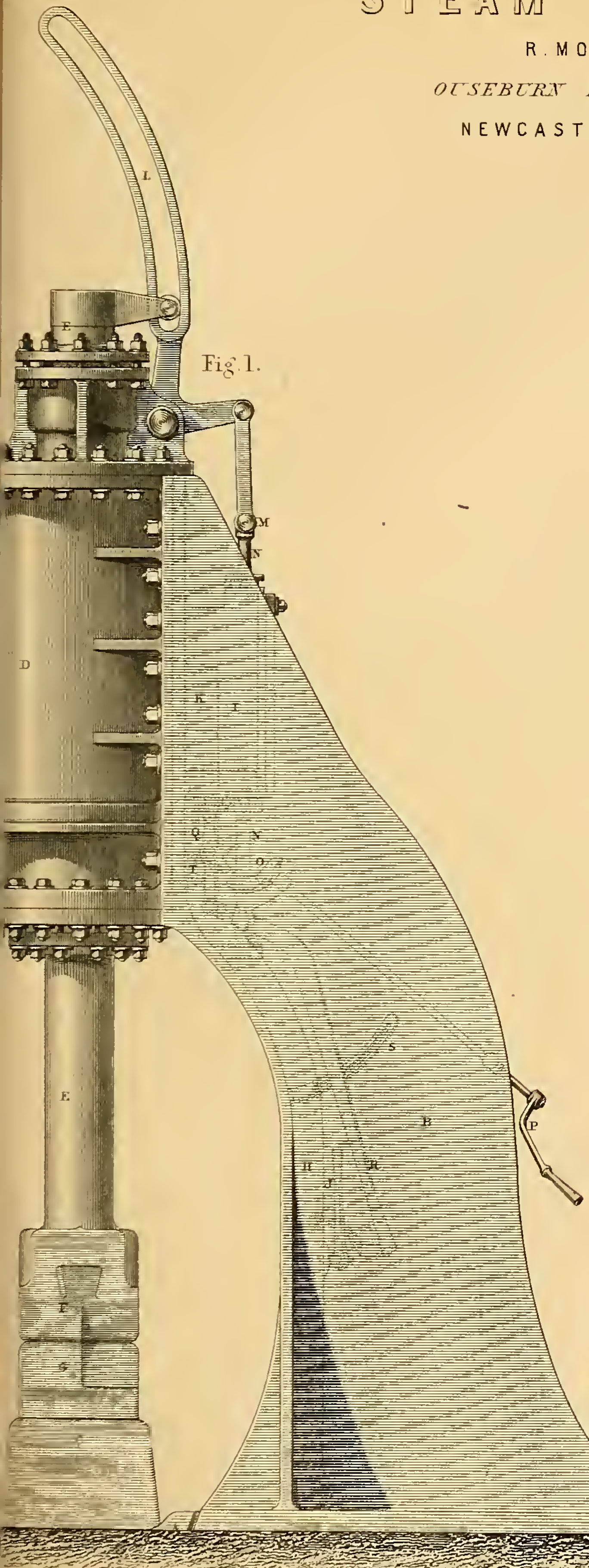
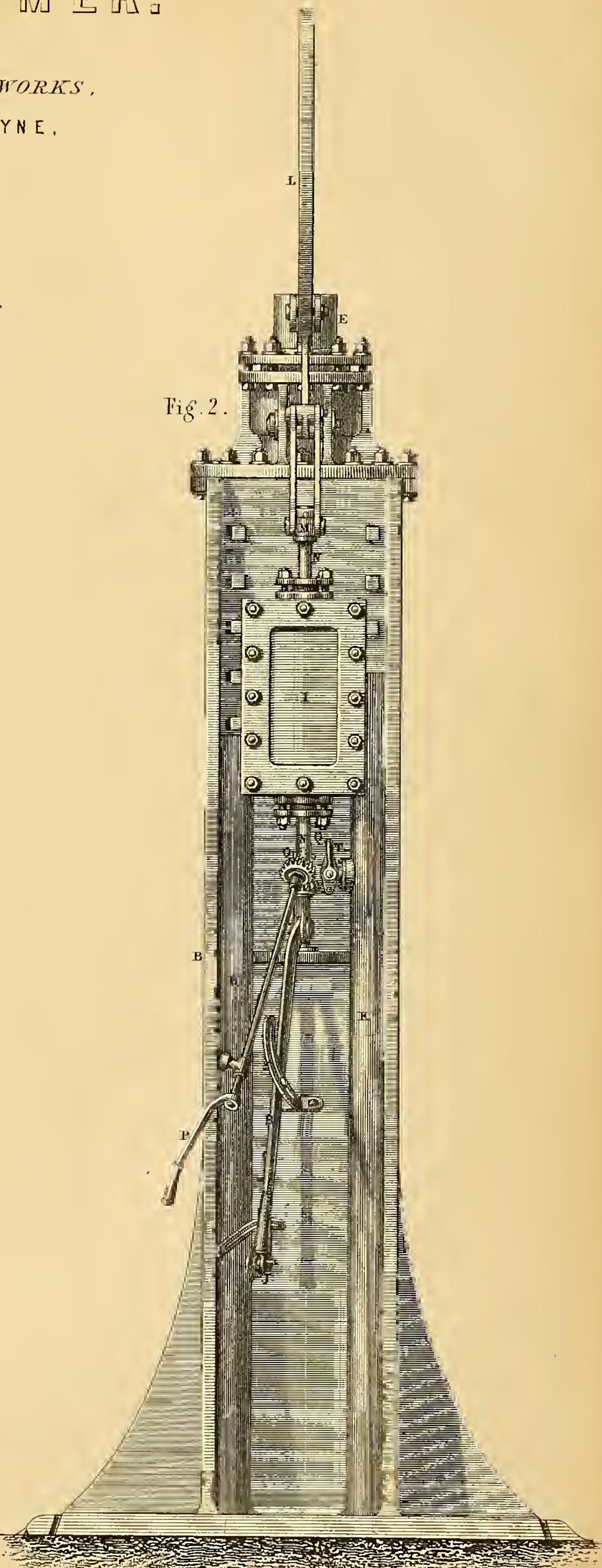


Fig. 2.



— SCALE. —

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will himself smile on discovering his oversight. The cause of these changes is merely the expansion of the glass on being heated, and its contraction on being cooled. In the one case the glass, expanding, enlarges its capacity, and consequently, the water or mercury having to fall, the glass gives the appearance of falling in the thermometer stem, and the reverse on the glass being cooled, and of course contracted in its internal capacity.

That this is the fact may easily be proved. Take a small bottle, say 2½ inches diameter, the proportion adopted in the above experiment, and fill it with water or mercury. Have a cork well fitted, in which insert a glass tube of about 12 inches long, and a bore of 1-8th or 1-10th diameter. On pressing the cork into the neck of the bottle, the water or mercury will rise in the stem, thus forming a complete thermometer. On the bottle being plunged into a vessel of boiling water, the level in the tube will be immediately depressed, indicating what Mr. Cameron calls contraction; and again, on being taken out and plunged in a vessel of cold water, the level in the tube will rise, indicating a supposed expansion; neither contraction or expansion, however, having taken place, the fall or rise being merely the result of the enlarged or diminished capacity of the glass bottle or bulb.

The alternate plunging into boiling or cold water may be repeated at will.

Mr. Cameron then adds what here merits particular attention:—"There is another point which is indicated more distinctly by the water, owing to its great *expansive power*, that is, the degree of heat marked when expanding does not coincide with the same degree when cooling." It is only necessary to add that this idea of the expansive powers of water is merely one of those popular theories which must be abandoned. I need not here repeat what I have stated at length in my treatise on heat, on the error of this supposed expansive power of liquids, and to which I would take the liberty of referring Mr. Cameron. That a body of mercury, enclosed in his 2½-inch thermometer, and which must have been 5 lbs. in weight, should be instantaneously heated, is in fact a physical impossibility, on the assumed and equally erroneous popular theory of each particle coming in succession into contact with the source of heat. But look at it in another point of view, and which will be found entirely consistent with the laws of heat. On the glass being heated to 212°, by being plunged into boiling water, the myriads of atoms of the liquid, which are in contact with it, are instantaneously vaporised. These vapours—atoms under the true Daltonian theory—are at once diffused through the mass, and produce that homogenous temperature which could never be otherwise obtained.

I conclude by concurring in the remarks of Mr. Cameron, and which are peculiarly applicable to the subject under consideration, viz.:—"Past experience enables us to perceive that we have trusted too much to popular theories, instead of resting on clear fundamental principles. It would be well if we could forget much of the past theories, as there is no doubt they have stood in the way of a clear perception of the science of energies." I have only to add that among those popular theories which should be forgot, may be classed the assumed heating and expanding of liquids, while they still retain their liquid form and character.

C. Wye Williams.

Liverpool, January 17, 1861.

THE REVOLUTION OF BODIES ON THEIR AXES.

A delicately balanced magnetic needle pointing north and south, has no tendency to revolve upon its own axis; the case in which it is contained may be made to do so, but the needle will still continue to point in one direction, thus indicating with the greatest nicety any movements on its axis of the box beneath. Let a mariner's compass travel in a circle, and let one side of its case be always presented to the centre of that circle; in one revolution the needle will have pointed to every side of the box. In this instance either the box or the needle has most decidedly revolved upon its axis, and the motion been rendered visible. If the box, the moon does so likewise.

William H. Harrison.

Haverfordwest, January, 1861.

THE COLOUR OF STEAM PIPES AS AFFECTING THE RADIATION OF HEAT.

Having occasion to heat a small hall with steam I had a great objection against painting the steam pipes black, for the sake of appearance, and I was told if I painted them white, I should have no heat. Doubting this, however, I made some experiments with white and black painted pipes. The result was, that the thermometer in a given time stood exactly at the same point. Thinking that there might still be some mistake I carefully noted the temperature of a flat of our mill, and also tested the heat at different distances from the steam pipe. I then had the pipes painted *pure white* (oil paint), and noted the results: I found that the heat in the flat got up fully as soon with the white pipe, and on suspending the thermometer at the same distances from the pipe, in the same time, the thermometer rose fully two degrees higher.

Now it seems to me to be a very common opinion that a *white painted* pipe will give out no heat. As the experiments were carefully conducted, perhaps some of your correspondents could give me the results of their experience.

January, 1861. A Subscriber.

LUNAR MOTION AND MAGNETISM.

I feel much obliged by the insertion in your magazine of my article on the rotatory motion of the moon. Mr. White of Easdale answered it, by referring to the motion of the shaft and crank pin of the steam engine. The pin he says "may be distinctly seen to turn on its axis in the brasses of the connecting rod." I must admit this to be a very plausible argument, but it is more apparent than real. To ascertain its real value, let us follow it out a little. He states that the pin turns on its axis; if it does, then every particle of the pin, however small, must turn on its own axis also; if he reduces it to a bundle of wires, each wire will turn on its own axis, also every particle of the crank; and if the crank were to be converted to a cylinder, every particle of the cylinder would also turn on its own axis. If Mr. White looks at the pin from the shaft he will see that the pin does not turn on an axis within itself; if he will extend the shaft to the same length as the pin, grasp the pin with the hand, and set it in motion, the shaft will soon make him feel that it is the axis of the pin's motion, and thus his sense of feeling will correct his sense of vision. In so far as sight is concerned, it depends upon whether you look at it from the earth, from the shaft, or from the outside of the crank and pin (as Mr. W. did), or some other planet beyond the moon; therefore, the earth is the moon's axis, as is seen in the shaft, magnet, &c.

With regard to the argument of Sir John Herschel, who states:—"Should any of our readers be in this predicament, we recommend him to plant a staff upright in the ground, and grasp it in both hands, walk round it, keeping as close to it as possible, with his face always turned towards it, when the unmistakeable sensation of giddiness will effectually satisfy him of the fact of his rotation on his own axis." In addition to Mr. Mitford's unanswerable arguments, I would recommend Sir John to convert the circle he walked in, into a cylinder, turn it round, and he will see that the stick is the axis in both cases. I certainly did not expect such a very weak argument from such a quarter. But our Government officials have of late been very unfortunate in several respects; we have here Sir John, with the motion of the moon; Professor Airy with the mariner's compass and iron vessels; and the engineers with break-waters. There is good reason for the astronomers holding to the opinion, that the moon should have an axis within itself, for if it has not, their whole system of astronomy falls, they stumble at the very first step of their investigation. If they are in error in what we can examine, how can we believe them when we have it not in our power to do? I never could see that the Newtonian hypothesis was a correct one, that the planets were kept in their position and course by gravity and centrifugal force; or, in other words, attraction and a chance motion, or a cause or power and an effect. I consider attraction as the cause or power, motion as an effect of a power, or some powers, an effect which stops in all the other operations in nature we know of, while they discard another power which we find pervades all nature. I mean repulsion. A few cases may be sufficient to show this. Specific gravity shows, that in every article we examine there is a certain ratio between the attractive and repulsive powers (a sclesling power); we also have the shapes, more particularly the specific gravity, form, hardness, &c., of the various crystals, the various properties of vegetable and animal matter, there is the power of the magnet, its attracting and repelling power is well known. Twelve or fifteen years ago, I made several magnets, one of which had a very peculiar property, one of its ends attracted at one distance and repelled at another, and the change from the one to the other was almost instantaneous. It was many years before I could discover the cause of this. I found, at length, that it had more poles than two, that the middle one was much stronger than the others. When the needle was within the influence of that end pole, it attracted or repelled; while beyond this, the stronger one exerted its influence. To prove the accuracy of this, I make a magnet with holes in the ends, and placed in them small magnets, with the opposite poles projecting, and found that it had the same effects; the suddenness of the change will be in proportion to the relative power and distance of these poles from each other. If this happens on a small scale, why may it not occur with the planets, and may not the earth exert the same attractive and repelling power over the moon, and the sun over both, and all the other planets on each other? I shall most likely be met by the mathematician, who will demonstrate that the law of repulsion, is in the ratio of the square of its distance, which would reach to a very inconsiderable distance, but I appeal to nature, the best of mathematicians, and see what she says on the subject. By dissolving a piece of zinc, its magnetic power has been carried from Europe to America. Then, we have the tides, which show an attractive and repelling power of both sun and moon, for if there had been only an attraction, there would have been only one tide each day, that is, one tide for every revolution of the earth, while we have two tides each day, that is, both an attracted and repelled tide. Thus showing that these astronomers are not only in error on the first step of their inquiry, but that even under their feet they have made their calculations upon erroneous data and formula; they must begin and do their work over again, as we have all to do sometimes. How can they account by the power of attraction alone, for the moon going steadily along, while the earth has a revolving and reciprocating motion? I think that both must have a magnetic power, that is, they have a repulsive as well as an attracting power, but that their poles may be differently situated, and that there may be a periodical change in the earth's magnetism, either in power or kind, by the heat and cold.

Are the officers in the compass department in better condition, as regards the compass and iron vessels, &c? I think not. What have they done to meet the difficulties shown by that noble investigator, Dr. Scoresby, and by the Liverpool Committee. The astronomer royal acknowledged before the British Association at Aberdeen, that they exceeded his anticipations. Mr. Evans, head of the compass department, in 1859 makes a splendid statement and gives advice; in 1860 he makes another statement and gives new advice, contradicting his former, neither of which he admits will meet these difficulties; and although he shows also the results of many very valuable investigations by officers of the navy, he admits that "a divergency from these conditions will arise when the inductive magnetism of the hull or machinery predominates; and it is inferred, especially from the example of the *Royal Charter*, that large quadrantal deviations and fluctuating sub-permanent magnetism (due to the hull alone) are existent, and give rise to conditions of compass disturbance, which are beyond prediction, and which have hitherto baffled inquiry, and given a completion to theoretical deductions varying as regarded from different points of view." When I saw these candid acknowledgments, I wrote to the Duke of Somerset, stating that I had seen Mr. Evan's statements which reminded me that I had written to the Lords Commissioners of the Admiralty, on the 28th July and 2d October, 1858, offering to improve the mariner's compass with regard to iron vessels, and that I never had an answer, that I thought my plans would relieve them of their difficulty. I got the following answer:—

ADMIRALTY, *October* 9, 1860.

SIR,—In reply to your letter of the 2d inst., I am commanded by my Lords Commissioners of the Admiralty, to acquaint you that their Lordships have received the letters which you addressed to them in 1858, on the subject of the mariner's compass, but that your plans are not required.—I am, sir, your obedient servant,

(Signed)

It is one thing to make investigations, and another thing to apply them properly. Will they drivel on in this way from year to year? How long is it since Dr. Scoresby showed them their deficiencies, and yet they have not advanced one step further, and on every hand are refusing assistance. Mr. Evans tells us the Admiralty refuses all improvements on binnacles; it now refuses plans. In the blue-book of the committee of the House of Commons on harbours of refuge, 1858, it refused everything that had not been tried; here the tried, the untried, and unknown plans meet the same fate.

The great use of experiments has been shown by the valuable experiments made many years ago by Mr. Stevenson, on the force of waves. What good has been done with them? It seems only to have raised in their minds hobgoblin fears, as shown in their statements, "that it would take as much money to make a floating break-water, as would build a stone one; that it would take £100,000 to move one, one mile long;" and with such scientific information, "that a fleet was a floating breakwater."

Many of their engineers held that the oak shaped, or sloping breakwaters was the best and strongest. So late as 1858, the majority of break waters were constructed of that shape. In the *Witness* in November, 1859, I repeated a number of my former statements, and showed that as the wind did not exceed 50 lbs. on the square foot, which was the only power acting on the sea, when acting on these inclined planes, produced a force of 6000 lb. on the feet, as shown by Mr. Stevenson's tables, and was the means of their own destruction, and every thing that came within their vertia. I was glad to see by the blue-book of the committee of the House of Lords, on break-waters, in 1860, that most of the engineers are now of the same opinion, and that if any break-waters are formed of that shape it will be because the great depth will not admit of any other, instead of being the strongest. But there is still room for some talented engineer with influence, to devise a sea front that will reduce the waves to their smallest dimensions, as alluded to by me in November, 1859.

JONATHAN DAVIDSON.

Edinburgh, January, 1861.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL SOCIETY.

The anniversary meeting of this society was held recently, General Sabine, Treasurer and Vice-President, in the chair. The anniversary address was delivered, after which the medals were presented as follows:—The Copley Medal, to Professor Robert Wilhelm Bunsen, of Heidelberg, Foreign Member of the Royal Society, for his "Researches on cacodyl, gaseous analysis, the volcanic phenomena of Iceland and other researches;" a Royal Medal to Mr. William Fairbairn, F.R.S., for his various "Experimental inquiries on the properties of the materials employed in mechanical construction;" a Royal Medal to Dr. Augustus Waller F.R.S., for his "Investigations into the anatomy of physiology of the nervous system, and for the introduction of a valuable method of conducting such investigations;" and the Rumford Medal, to Professor James Clark Maxwell, for his "Researches on the composition of colours, and other optical papers. The Society then proceeded to the election of Council and officers for the ensuing year. The following gentlemen were declared duly elected:—President, Sir Benjamin Collins Brodie, D.C.L.; Treasurer, Major-General Edward Sabine, R.A., D.C.L.; Secretaries, William Sharpey, M.D., LL.D., and Mr. George Gabriel Stokes, M.A., D.C.L.; Foreign Secretary, Mr. William Hallows Miller, M.A.; other members of the Council, Mr. John Couch Adams, Sir John Peter Boileau, Mr. Arthur Cayley, Mr. William Fairbairn, Hugh Falconer, M.D., William Farr, M.D., D.C.L., Mr. Thomas Graham, M.A., D.C.L., Sir H. Holland, M.D., D.C.L., Mr. Thomas Henry Huxley, Sir J. G. Shaw Lefevre, M.A., D.C.L., Mr. James Paget, Mr. Joseph Prestwich, Mr. William Spottiswoode, M.A., Mr. John Tyndall, Ph.D., Alexander William Williamson, Ph.D., Colonel Philip Yorke. After the election, the Fellows and their friends dined together at the Thatched House, General Sabine occupying the chair.

ROYAL INSTITUTION.

"On the chemical history of a candle," by Professor Faraday:—The cause of the luminosity of flame was the principal point to which the attention of the audience was directed. After some preliminary remarks on the form and general character of flame, Mr. Faraday said that, though the flame of a candle, when burning steadily appears to be a solid mass, it is merely a shell of luminous particles, of which fact an illustration was given by holding a piece of paper for a moment in the centre of the flame, which scorched a ring on the upper surface of the paper, and not a disc, as would have been the case if the flame were hot throughout. Immediately above the wick of a candle, when burning, a dark part is observed, where the vapour which causes the luminosity of the flame is collected before it is burnt, and by means of a bent tube, one end of which was introduced into the centre of the flame, this vapour was drawn off and burnt at the other end, some distance from the candle. By applying the tube to the other parts of the flame, the products were collected in the same manner, thus showing the different conditions of various portions of the flame. When the products just above the flame were collected, and a lighted taper was introduced into the vessel, it was extinguished, instead of setting fire to the vapour. To exemplify the principle on which the luminosity of flame depends, Professor Faraday first exploded some gunpowder with which iron filings were mixed; the bright incandescence of the sparks thus produced being an illustration of the mode by which a jet of hydrogen gas, though of itself not luminous, becomes intensely brilliant when a number of solid particles are introduced into it. In such cases the particles introduced may be merely rendered incandescent without being consumed, as when lime is introduced into the flame of oxygen and hydrogen gases, by which means the beautiful Drummond or lime light is produced; or when platinum wire is put into a hydrogen flame. In other cases the solid particles undergo combustion, as in the flame of a candle, by the combustion of the carbon of the tallow. To show the large quantity of carbon, or charcoal, contained in combustible substances that afford the most light, some cotton dipped in turpentine was inflamed. The volume of smoke that rises during the ordinary way of burning turpentine is extremely dense and offensive; but the same smoke, when properly burned in a lamp adapted for the purpose, affords a beautiful and brilliant flame. Several experiments were exhibited for the purpose of illustrating the different appearances of flame under different circumstances of combustion, and for illustrating that the incandescence of solid particles is the cause of light during combustion. An Argand lamp was employed in the course of these experiments to show the effect of stopping the supply of air to the centre of the flame in diminishing the light; and the burning of zinc in a red hot crucible was a beautiful illustration of the production of light by the incandescence of the vapours emitted. The sudden incandescence of the minute particles of lycopodium when thrown on to flame was one of the experiments that appeared most to delight the juvenile portion of the audience. A quantity of that substance was put into one end of a long tube, and when thrown on to the flame of a taper held at the other end it occasioned a large and brilliant flash of light. It is in this manner that the artificial lightning at theatres is produced. The last experiment was the burning of a candle under an inverted glass receiver, the sides of which quickly became covered with mist. The production of water by combustion, of which this experiment affords an example, was then briefly alluded to as one of the marvels in the chemical history of a candle, which would be explained in a subsequent lecture.

GEOLOGICAL SOCIETY.

DECEMBER 19, 1860.

"On the geological structure of the south-west highlands of Scotland," by T. F. Jamieson, Esq.

"On the position of the beds of the old red sandstone in the counties of Forfar and Kincardine, Scotland," by the Rev. Hugh Mitchell.

INSTITUTION OF ENGINEERS IN SCOTLAND.

"Notes on the early history of the air engine," by Mr. Patrick Stirling.

CHEMICAL SOCIETY.

December 20, 1860.

Mr. I. H. Sims read a paper "On the laws of gas absorption." He showed that the really condensable gases, sulphurous acid and ammonia, did not obey Dalton and Henry's law, save at some elevated temperatures.

Dr. Bence Jones read a paper "On sugar in wine." He confirmed Brücke's statement as to the habitual presence of small quantities of sugar in the healthy secretion.

Dr. Oppenheim read papers "On the separation of tellurium from selenium and sulphur," and "On nitro-prusside of sodium as a re-agent."

FRENCH ACADEMY OF SCIENCES.

November 21, 1860.

A memoir "On phosphorous and impurities in the atmosphere," was read by M. Barral. The results of his experiments varied considerably; but taking a mean, he computed (we turn the French measures into English), that 440 gallons of the rain water examined contained from 3 to 15 troy grains of phosphorous. He computes that the atmosphere delivers annually to the soil 400 grammes of phosphoric acid to each hectare of land, or about 2,400 troy grains to each acre. Phosphorus, as everybody knows, is extracted from bones, in which it exists, in the shape of phosphate of lime. This phosphate is an essential part of the food of cereal plants, and hence the wonderful effects of bone meal in increasing crops. That water, by itself, or its elements, oxygen and hydrogen, is necessary to the growth of plants, has been long known, but it is a new and interesting fact, if M. Barral's conclusions are correct, that the clouds which supply water to the earth send down a refined and valuable manure with it. No doubt the quantity is inconsiderable, but, small though it be, the restoration of fertility to exhausted lands by allowing them to lie fallow for a course of years—a practice followed by the Arabs—must be mainly or entirely the effect of it. Wheat is an exhausting crop, because much of its substance consists of phosphoric acid, and M. Barral admits that the quantity of this substance carried off by one crop of wheat could not be replaced by the atmosphere in less than twenty years.

The Minister of Marine sent in an extract of a report from Capt. Trebuchet, of the *Capricieuse* corvette, dated Amboyna, August 28, 1860, and in which he states that on the night of the 26th of that month, while tacking to reach Amboyna, lying at about 20 miles E.N.E., he and his crew witnessed the curious spectacle of the milky sea, which the Dutch call the winter sea, because both the sky and the waters present the appearance of fields covered with snow. The phenomenon lasted from 7 p.m. until the return of daylight. They at first attributed it to the reflection of the moon, then only three days old; but, as the appearance continued after the moon had set, this explanation had to be discarded. A bucketfull of sea water being drawn up and examined, it was found to contain about 200 groups of animalculæ of the thickness of hair, but of different lengths, varying between one and two-tenths of a millimetre, and adhering to each other by tens and twenties, like strings of beads. These insects emitted a fixed light similar to that of the firefly or glowworm, and it was admitted on all han ls that the white appearance of the sea could only be attributed to these minute creatures, the numbers of which must therefore exceed all imagination.

M. Duroy announced the discovery of a new neutral and colourless iodide of starch. It is well known that iodine gives a blue colour to starch, thus forming an iodide. M. Duroy brings this iodide into contact with yeast, and thus deprives it of its colour. In this state it is very soluble in water, insoluble in alcohol, sweet, gummy, and incapable of crystallization.

At the last sitting M. Chasles replied at great length to a paper by M. Breton, in which the former's labours on the porisms of Euclid were severely criticised. M. Chasles, in refuting his antagonist's arguments, does full justice to the sagacious arguments of the celebrated geometrican Simpson regarding those porisms, only a small part of which has been handed down to us in a mutilated and confused state by Papus. The Minister of Marine sent in an account, by Lieutenant Laporterie, of the effects of a stroke of lightning experienced on board the St. Louis man-of-war, in the roadstead of Gaeta, on the 10th ult. This account was accompanied by the platinum point of the lightning-conductor which received the stroke, and a bit of melted copper from the rod of the same conductor. M. Laporterie states that after a violent gale which blew on the 7th and 8th the sky was covered with thick masses of clouds, and a storm broke out on the 10th, chiefly confined to the N.W. part of the heavens. At 1 30 p.m. the electric fluid struck the conductor of the main-mast, accompanied by a detonation equal to that of a heavy discharge of artillery. A portion of the platinum point was melted, and the rest broken off from the rod. Curiously enough, the base of this platinum point, in the shape of a cone, had remained uninjured, with the screw in, by which it had been fixed to the rod, while the remaining extremity of the rod, where the screw had been snapped off from was melted. The conductors of the fore and mizen masts had received no injury, but a sergeant who was seated near the funnel of the engine, at a distance of 19 feet from the main-mast, felt such a violent shock that he thought he had been struck by some Sardinian projectile which had fallen on board by accident. He thought he felt blood trickling from the wound, and it was only after undressing and submitting to an examination that he could be persuaded he had not been wounded. At the foot of the main-mast a bluish flame, 2½ feet in length, was noticed, but it immediately disappeared. The pocketknife of one of the sailors was strongly magnetized, and the same was the case with some steel pens in the officers rooms.

M. Gaudry sent in a new communication on his geological excavations in Greece, in which he announced the discovery of two new genera of mammiferous animals. The first of these is represented by a jawbone, which contains a canine tooth of the cat species, the last molar, and an inciser like those of a dog, and the remaining teeth similar to those of a bear. M. Gaudry proposes to call this new genus *Metarctos*, to denote that it ought to be placed after the bear. The second animal belongs to the Pachydermata, and is not far removed from the Palæotherium and the Paloplotherium; its size, judging from its jaws, must have been that of a small pig. M. Gaudry calls it *Leptodon*, because in proportion to their length, its teeth were very slender. Dr. Guggenbuehl sent in a paper on the establishment of the Abendberg, in the Bernese Oberland, near Interlaken, where idiots and crétins are received. The author shows that crétinism is an affection of the cerebro-spinal system, consisting of various pathological conditions causing a slow and irregular development of the body.

SCOTTISH SHIP BUILDERS' ASSOCIATION.

At the last monthly meeting of this association a paper was read "On river steamers," by Mr. John Ferguson, in commenting on the peculiarities of the different styles of vessels employed in that traffic, both in this country and America, he urged upon shipbuilders and shipowners generally, and the association particularly, the propriety of doing something to mitigate the numerous disagreeables which usually accompany the periodical migrations of the travelling world to the neighbourhood of the Clyde, and of that very large class of citizens who go down to the coast in river steamers; not forgetting the myriads of dusky denizens who once a year betake themselves in shoals and nations to every village, isle, and inlet of this famous river. He observed that the principal considerations in the construction of river steamers were speed and accommodation. Our present river steamers were second to none for the first of these qualities, but immensely inferior in accommodation to the steamers of America. This is partly owing to the peculiar construction of our boats, which would render such superstructures as the Americans rejoice in unsafe; and partly owing to the restraints imposed upon them by the Legislature and our local harbour authorities—in the shape of special measurements for tonnage, and taxes levied according to those measurements—presenting an apparently fatal barrier to such erections. The first of these reasons is the best, as the narrow and tortuous character of the Clyde for a considerable part of its upper reaches, and the shortness of the distances, renders such large vessels as the American river steamers impracticable; but he was satisfied by the results of such slight departures from our orthodox proportions as had already taken place, that a considerable increase of breadth and capability of sustaining at least one tier of deck saloons could be obtained, even under the present system of construction, without any diminution of the speed. The fear of such saloons, or shelter for deck passengers being included in the tonnage he believed to be greatly over-estimated. The Merchant Shipping Act did not contemplate any such protest on improvement, when it specially exempted from measurement all such erections as were "exclusively for the shelter of deck passengers;" and all travellers by river steamers being only deck passengers according to the Act, such erections, specially and exclusively for their shelter, were evidently entitled to the exemption specified.

An animated discussion ensued on the salient points of the two systems, evidently to the advantage of the saloons; and George Smith, Esq., moved that the association communicate with the Board of Trade, with a view to the settlement of the tonnage question on a satisfactory basis, as there could be no doubt of the immense advantage of such erections to the travelling public, in our rather variable climate.

The motion was seconded by James Watson, Esq., with the suggestion that a drawing or model of the proposed design should at the same time be submitted for the consideration of their Lordships.

A number of very fine models were exhibited, each of which embodied to a greater or less extent the desired advantages, and seemed to meet the approbation of the meeting.

AMALGAMATED ENGINEERS.

On the 10th of November a dinner was given at Radley's Hotel, Blackfriars, to celebrate the presentation, by the executive council of this society, to Mr. William Newton, of a testimonial for the services he had rendered to their society and trade. Mr. Thomas Hughes, the author of "Tom Brown's School Days," occupied the chair, and was supported by Mr. Furnival, Mr. Ludlow, and other gentlemen who had taken an interest in the cause of the engineers during the strike of 1851. The chairman, in proposing the toast of the evening, said that it was upwards of twelve years since he first had the pleasure of making Mr. Newton's acquaintance; and nine years ago he met him almost daily under very peculiar and trying circumstances, when the wisest heads might have made mistakes, namely, during the well-known engineers' strike, and the esteem which he then formed for him had never been shaken. The chairman concluded by giving the health of Mr. Newton, which was drunk with great applause. An address, elegantly engrossed, recounting the services of Mr. Newton, and especially referring to his defence of the institution at Edinburgh, in answer to the charges brought against it by Mr. Adam Black, M.P., was then presented to the guest of the evening, together with a silver goblet containing £300. Mr. Newton, in acknowledging these gifts, incidentally observed that eighteen years ago he came to London as a tramp looking out for work, his sole property being a little bundle containing a shirt and a pair of stockings, and ignorant how he could obtain food for the next week. He then entered into a history of his labours in connection with the trade movement, and pointed out the advantages which had resulted from the amalgamation of their different societies into one institution. After the strike, when they were bent but not broken, the society obtained increased vitality; for while they then commenced with 7000 members, to a certain extent disorganised and demoralized, they had now more than 20,000; while the employers' society, which started under such promising auspices, had ceased to exist. He contended that it was for the interest of employers to support this and similar bodies, as in periods of depression, arising from over speculation or other causes, they presented a resource for the workman to fall back upon, thus preventing much destitution and misery, and lightening the poor rates. Mr. Ludlow and other gentlemen subsequently addressed the meeting. According to the statement of Mr. Heaps, the president, the society has, since the amalgamation about nine years ago, distributed among unemployed, sick, and disabled members, &c., £209,837, exclusive of the expenses of management.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

November 13, 1860.

Dr. Fairbairn, F.R.S., made some observations respecting experiments conducted in the Dukinfield coal pit, for the purpose of determining the rate of increase of temperature below the earth's surface. He stated that from these experiments a mean increase of one degree Fahrenheit for every seventy-one feet had been arrived at; and be promised on a future occasion to communicate the details of the determinations.

"On a system of periodic disturbances of atmospheric pressure in Europe and Northern Asia," by Mr. Baxendell, F.R.A S.

Whilst engaged some time ago in an investigation of the phenomena of the general disturbances of the atmosphere, the author had been led to conclude that moderately accurate determinations of the sums of the oscillations of the barometer, for given periods at different places on the surface of the earth, would afford valuable information respecting the nature of these disturbances, and, at the same time, throw additional light upon the causes by which they are produced. Determinations of the *statical* element of mean pressure are obviously of very limited use in an inquiry of this kind; but, notwithstanding the importance of the subject, meteorologists have hitherto generally neglected to ascertain, even approximately, the values of the *dynamical* element as represented by the sums of the oscillations of the mercurial column. In none of the many volumes of observations which issue from the public observatories of this country and the continent has the author yet seen any attempt made to deduce the values of this element.

Accurate absolute values of the barometric dynamical element can, of course, be obtained for those places only where hourly observations are made; but, as it appeared to the author that good comparative values would be quite sufficient for the general purposes of his inquiry, he decided to confine his attention, in the first instance, to oscillations derived from observations made once a day only. By this plan, the regular diurnal oscillations are completely eliminated; the results are adapted for very fair comparison with each other; and a greater number of sets of observations become available for the purposes of the inquiry. This method has accordingly been employed in the discussion of a very considerable number of observations made at various places in Europe and Asia, and a table is given showing the mean monthly and annual sums of the oscillations of the barometer at seven stations in Europe and six in Asia as derived from observations extending over periods varying from six to fifteen years. It is, however, remarked, with reference to the results given for Greenwich, that as the individual observations of each day at Greenwich are not given in the published volumes, these results are derived from the daily means, and not from single daily observations, as in all the other cases. Diagrams of the curves laid down from the numbers in this table accompany the paper. All these curves show a principal minimum in one of the three summer months, June, July, or August; and in many of them there is a second minimum in one of the two winter months, January or February. With respect to the two maxima which occur between these minima, it is shown that the interval between their summits gradually increases as we advance from the eastern to the western stations. Thus, at Nertchinsk (51 degs. 19 min. N., 119 degs. 36 min, E), the first maximum occurs in the middle of April and the second in the second week of November, the interval being nearly *seven* months; at Barnaoul (53 degs. 20 min. N., 83 degs. 57 min. E.) the first maximum takes place in the middle of March and the second in the middle of November, the interval being *eight* months; at Catherinbourg (56 degs. 49 min. N., 60 degs. 35 min. E.) the first maximum occurs in the second week of March and the second about the second week of December, the interval being *nine* months; at Tiflis (40 degs. 42 min. N., 44 degs. 50 min. E.) and at Lougan (48 degs. 35 min. N., 39 degs. 20 min. E.) the interval is also about *nine* months; at Stockholm, and also at Milan, the first maximum occurs in the middle of February and the second in the middle of December, the interval being *ten* months; but in the British Islands there is only one principal maximum, which occurs about the second week of January, and which appears to be formed by the union of the first maximum of one year with the second maximum of the year preceding, the interval between the two maxima being *twelve* months. It is evident, therefore, that these maxima move across the two continents in opposite directions, the course of the first being from West to East, and that of the second from East to West.

As the apparently compound maximum of January is not greater than either of the separate maxima, the author considers it very probable that both maxima are produced by the same disturbing cause, such disturbing cause taking its rise in Eastern Asia in the month of November, and gradually moving westward until it arrives in the British Islands in January; then, reversing its course, it returns with a diminished velocity to the region of its origin, where it arrives in the month of April, and afterwards rapidly disappears under the influence of an increasing temperature, to re-appear later in the year on the return of a low temperature.

As the times of first appearance and of final disappearance of the disturbing cause in Eastern and Central Asia correspond very nearly with the times of the breaking up of the monsoons in the China Sea and Indian Ocean, it is considered very probable that the two systems of phenomena are directly connected with and dependent upon each other.

Attention is drawn to a very decided convexity of nearly all the curves in the month of October, indicating the operation of a secondary disturbing cause acting during that month over the whole breadth of the two continents.

In concluding, the author remarks that the first application of the method he has employed appears to be due to Dr. Dalton, and that the only other application of it which he has yet met with is in Mr. Broun's very able discussion of the Makerstoun observation.

November 19.

A letter was read from Mr. R. D. Darbishire, relative to the deposits from the raised sea bottom found at Capell Backen, Uddevalla, near Gottenburg, in Sweden. He observes that "the hill side from a height of about fifty feet above the level of the sea to that of about two hundred and thirty feet, consists of layers of fossil shells, varying from ten to thirty feet thick, alternating with beds of more or less coarse gravel and clayey sand.

A letter was read from Mr. John Hepworth, of Crofts Bank, describing his mode of washing and mounting calcareous and silicious shells, dry and in balsam.

"On cleaning and preparing diatoms obtained from soundings and other sources." by Mr. J. B. Dancer, F.R.A.S.

The secretary exhibited a portion of sea weed from the Gulf Stream, in which were found a few diatoms, remains of entomostraca, &c., contributed by Mr. Ada S. Lima, of London.

November 27.

"On the prevalence of certain forms of disease in connection with hail and snow showers, and the electric condition of the atmosphere," by Thomas Moffat, M.D , F.G.S., F.R.A.S.

SOUTH WALES INSTITUTE OF ENGINEERS.

November 14, 1860.

The general meeting of the members of this Institute was held this day, at the Castle Assembly Rooms, Merthyr Tydfil. The President, Lionel Brough, Esq., in the chair.

After the election of new members, the proceedings commenced with the discussion of a paper "On blast furnaces," read by Mr. H. Ogden at a previous meeting.

Mr. Dorman's paper "On the economic value of fuel," which had been announced for discussion, was, in the absence of Mr. Dorman, postponed to the next meeting.

A paper read at the last meeting by Mr. R. Bedlington, "On the long work system of mining" was discussed, and the following new papers were read:—

"On a simple form of diagram for showing the motion of the valves in steam engines," by Mr. Cope Pearce.

"On an improved safety lamp," by Mr. Waring.

ASSOCIATION OF ASSISTANT ENGINEERS, GLASGOW.

The inaugural address of this association was delivered by Professor Rankine. The Professor expressed his gratification at the very large attendance of young men; and he proceeded to address them on the advantages which might arise to engineering science from this association. The field for the labours of this association was exactly of the same kind and of the same extent as the field for the labours of the elder society of engineers. It embraced the very same subjects. He had no doubt this association would cultivate every branch of engineering science, but there were parts of engineering specially entrusted to assistants, the principal of which was the geometry of engineering. This branch comprehended all operations by which the figure of the earth's surface was ascertained, preparatory to designing the surveying, the sounding for marine sections, and the like. Then come the very important subjects of the setting out of works, and mechanical engineering. The geometry of the latter part of that subject embraced the whole of designing mechanism, so as to produce the motions of the machine to bear a relation to each other. Professor Rankine then proceeded to discourse on the technical details of various branches of engineering, and of the instruments used by the profession, pointing out where valuable papers might be written on the former, and where the members of this association might endeavour in the latter to find out improvements. He specially pointed out that much of the knowledge in the department of assistant engineering was traditional, and that much time and labour was often lost by men trying to invent what in other places had been already long in use. He advised assistant engineers to keep in view to record and communicate their experiences, so that such evils to the profession might be remedied.

MONTHLY NOTES.

MARINE MEMORANDA.

The number of steamers navigating the rivers and canals of Russia is 358, of which 185 belonged to different companies, 170 to private persons, and three to the Ministry of Marine. Of the total, 93 belonging to companies and 122 to private persons were on the Volga and its tributaries. The steam-power of all of them is not stated, but that of 214 was 13,175 horse-power. As to the engines, 112 are represented to have been of high pressure, 67 of low.

The Americans have at present a regular system of nomenclature for their ships of war. The line-of-battle ships are christened after States, the frigates after rivers, the smaller craft more irregularly, but chiefly after individuals. As the last so-called frigate measures 4000 tons, we shall probably find their most formidable war-ships bearing the names of their mightiest rivers.

The number of vessels that entered the port of Sunderland during the year 1860 was 12,449, being an increase of 1,249 on the entries for the year 1859. The number of vessels which used the docks in 1859 was 4,849, in 1860, 6,544 being an increase of 1,695. The number of vessels built on the Wear during the past year was 112, being an increase of 12 on the number built in 1859, and of two on that of 1858. The ports to which the vessels were sold were Sunderland. Shields, Newcastle. London, and Liverpool—dividing 89 sail among them. The last named port, which did not take a single vessel in 1859, took eight last year. It is expected that the forthcoming vend of coals on the Wear for the half-year ending the 31st of December, 1860, will be the largest ever yet made up at that port. It will show a total shipment of upwards of a million and a half tons, being fully 100,000 tons increase on the vend for the corresponding half-year of 1859.

The parties engaged in the herring fishery off the eastern coast are now "making up" and congratulating themselves on the success which has attended their vigorous labours. It is estimated that the boats connected with Great Yarmouth have taken 8.000 to 10,000 clasts, or the enormous number of 100,000,000 fish. The sum thus obtained by each boat has been from £400 to £1,000, and all taken above £500 per boat is regarded as profit. At Lowestoft equally encouraging results have been obtained, the value of the fish caught being estimated at £50,000. one boat alone having taken 1,000,000 fish. The fishermen are paid according to the success which follows their exertions, and some of them will have £30, £40, and even £50 to receive at the hands of their employers.

It appears from returns furnished by the various Royal yacht clubs that yachting has made a decided advance of late years. This is shown in the subjoined table for the decade ending 1860:—

Year.	Yachts Afloat.	Gross Tonnage.	Average Tonnage.
1851	516	22,518	43·6
1852	587	25,007	42·6
1853	710	29,452	41·4
1854	762	31,484	41·3
1855	752	30,781	40·9
1856	742	31,321	42·2
1857	776	32,620	42·0
1858	728	32,654	44·8
1859	756	34,472	45·6
1860	756	33,873	44·8

There has thus been, on the whole, a tendency to the employment of a larger class of yachts. The amount of prizes offered last year in 113 contests was £4,279, and the number of men employed was estimated at about 3,400.

The model steamboat *Ichthyon* has lately been plying on the Serpentine. It merits attention as having been designed and built by Captain Beadon, of the Royal Navy. The experimental model is constructed upon the principle of the double canoe, and appears to be admirably adapted for testing the merits of the peculiar form of screw and mode of propulsion adopted by the inventor. This twinboat is, in fact, raised out of the water and supported upon two pontoons of a cylindrical form of two feet in diameter, and 18 feet long. These pontoons or tubes are each fitted with a solid conical spiral screw at the stem, driven by a direct centre shaft worked in the usual manner. The propellers are made to act together, or in opposite directions, in such a way that the vessel is driven by one or both, and may be turned in a sweep of little more then her own length. These propellers bore into the water under the prow of the vessel, causing little disturbance, and they appear to act equally well whether immersed or partially uncovered. In the passage from Bristol it is stated that this model, of only three tons burthen, roughly built, and very imperfectly fitted with machinery, towed two barges laden with 90 tons of stone in shallow water at the rate of three miles an hour, with 20 lb. steam pressure in the boilers, and when accidentally run upon a gravelly shoal she was able, with the aid of the propellers only, to clear her own way into deep water. The *Ichthyon* was designed rather for the navigation of canals, but the principle of construction appears to secure steadiness and stability, as well as other advantages necessary to gunboats and larger vessels of war.

A very satisfactory preliminary trial recently took place on the Clyde of a train of barges in tow of a steamer built by the Oriental Inland Steam Company on Bourne's plan for the navigation of rivers in India, which from the great dimensions of the vessels composing the train, and the novelty of their towing connections, have excited much interest here and elsewhere. The train, consisting of a steamer and five barges, is 931 feet in length over all, 30 feet beam, and 8 feet depth of hold. The steamer is fitted with engines on the double cylinder principle, high and low pressure; the boilers being capable of working at a pressure of 100 lbs. on the square inch, but on this the first trial a pressure of 50 lbs. only was used. The engines at this pressure made 26 revolutions, and the speed of the train ascertained by log was 7 knots. The steamer alone, with a pressure of only 35 lbs. on the boilers, attained a speed of 11 knots. The train, in charge of Mr. Alexander, pilot, of this port, went through numerous evolutions, and turned round in a complete circle in 8 minutes, being completely under control, which elicited from those who were afforded an opportunity of being present expressions of satisfaction with the result. We understand that an official trial will take place forthwith, under the immediate superintendence of several nautical and engineering authorities specially appointed by the Company to test the merits of the principle on which these vessels have been built.

The annual return of vessels built on the Wear and registered at the port of Sunderland has just been compiled, and shows that, for the first time since 1856, the trade is on the increase. The number of vessels built in 1856, was 154; in 1857, 143; in 1858, 110; in 1859, 100; and in 1860, 112. The tonnage represented by the entire build of last year was 40,201, being an average of 358 tons per vessel, or nearly 100 tons less than the build of 1853, when the rush to the Australian gold fields caused an extraordinary demand for large ships. Of the 112 sail built last year, Sunderland purchased 47; London, 17; Shields, 11; Newcastle, 6; and Liverpool, 8. The remainder were sold to 19 other ports. The classification was generally high, 17 out of the entire built having been 13 years' ships. The future prospects of the trade are encouraging, the loss of 3846 sail during the years 1859 and 1860 having cleared off a good deal of the superabundant tonnage- On the 1st inst., there were 74 vessels on the stocks, of which 30 were sold; while on the 1st of January, 1860, only 18 out of 72 vessels then on the stocks were sold. Iron shipbuilding, which has long been in a backward state on the Wear, is decidedly on the increase. There are at present eight iron vessels in the course of construction, with an aggregate tonnage of 5655. The price of high-classed wooden vessels rules high, in consequence of the scarcity of teak; a 13 years' ship, with full East India outfit, would not be laid down at present by any of the builders under £17 per ton. The following table shows the state of the trade for the last ten years:—

Year.	No. of Ships Built.	Total tonnage.	Average Tonnage.
1851	146	51,823	355
1852	142	56,645	398
1853	152	68,479	454
1854	151	66,929	443
1855	151	61,159	405
1856	154	63,049	409
1857	143	54,780	383
1858	110	42,003	281
1859	100	37,184	371
1860	112	40,201	358

The total number of ships for the ten years being 1361, with an aggregate of 642,250 tons.

The Grand Junction Canal Company have brought into use a very important principle in the application of steam power to canal navigation, which by reducing the cost of conveyance 25 per cent. below the expense of towing by horses in the way hitherto practised, will perhaps revolutionise the whole system of heavy goods traffic throughout the country to the great advantage of the public. It should be observed that the aggregate amount of canal traffic, instead of diminishing, has increased since the construction of railways, and is now 25,000 tons more than it previously was. The total length of canals now open in Great Britain is about 5000 miles, including all the branch lines and junctions, and these works represent a capital of some forty millions. The most peculiar feature in the steamboats which are now employed by the Grand Junction Company to ply between London and Birmingham or Manchester is an improved form of screw propeller, invented by Mr. Burch, of Macclesfield. This "waggle-tail" propeller has the advantage of keeping all the disturbance of the water immediately behind the stern of the boat, instead of spreading it right and left. The effect of this improvement is at once to secure the canal banks from being damaged by the wash, and to economise the motive power. A party of gentleman had been invited lately to accompany Mr. James Fulton, one of the company's officers, in a trip from the City Basin along the Regent's Canal to Paddington, a distance of five miles and three quarters, which was accomplished in an hour and a half, including the passage of five locks, and the Islington tunnel, half a mile long. The *Pioneer*, an ordinary fly-boat, 75 feet long by 7 feet extreme breadth, 25 tons burden, and drawing 2½ feet of water, with an engine of six horse-power, was the boat employed towing another fly-boat which was laden with a general cargo to go to Wolverhampton. The two boats were able to go through the locks at once, floating side by side, and thus saving much delay. It is stated that the *Pioneer* when tried at Manchester proved able to draw six loaded barges at once, with a total burden of no less than 300 tons. Four miles an hour, allowing for the locks and other hindrances, will be the average rate of steam performance, instead of two miles an hour, the usual speed obtained by horse-towing. The steamboat has stowage room for 2½ tons of coal, which will carry her from London to Birmingham and halfway back, superseding the expensive relays of horses and drivers requisite for so long a journey. This water locomotive is estimated to be nearly 30 per cent. cheaper than railway carriage, so that the canals are not done with yet.

Mr. Formby, a Liverpool shipowner, has recently turned his attention to the subject of obtaining a self-acting and self-sustaining means of pumping leaky ships while at sea, by means of which the physical powers and energies of the crew might be at once economised and rendered available for the ordinary purposes of navigating the vessel, instead of being expended on efforts devoted exclusively to keeping her afloat. In furtherance of this desirable object, Mr. Formby has invented an apparatus which is worked entirely by the force derived from the action of the ship's motion through the water, which, without materially interfering with the ship's progress, has yet sufficient power to maintain in motion a double-actioned pump. This appliance he has so far perfected as to have completed an apparatus suited to the requirements of a ship of 500 tons, and this he lately exhibited in operation on board a "flat," or barge, in the Mersey. The apparatus, which is simple, consists of two semi-discs, placed nearly at right angles to each other, in an arrangement somewhat similar to that in the fans of a screw propeller, and these are fixed on a wrought iron boss, at an angle of about 45° to its line of axis. These fans, or semi-discs, are each made of sheet iron riveted on the circular edge, but open on the line of the diameter. The fans are bolted on the boss with nuts and screws, so that, in the event of accident, they can be taken off and replaced in a few minutes. The fans are each 26 inches in diameter, and together, along with the boss, they weigh about 29 lbs. To this there is attached a chain formed of bar or rod links, each link is 18 inches in length, and they are so jointed that they will not twist or coil. This chain is 60 feet long, and weighs about 75 lbs. The apparatus so described may now be called complete. It is fixed to the stern of the vessel, and the fans are then thrown overboard. The motion of the vessel, and the resistance which they receive while being dragged through the water, causes the fans to revolve round the central axis of the screw, with a velocity proportionate to the speed of the vessel, and this revolution gives the working power to the apparatus. The chain referred to is jointed on the revolving shaft, at the further end of which is a pinion; this pinion is made to work a crank, which again is in communication with the lever working the cross-head of a double-actioned pump, the action of which is sustained by the motion of the vessel, or of the adverse current of water which acts upon the fans. Such is the principle, and such the operation of Formby's patent water-power apparatus. Now for an explanation of its actual operation. In the case referred to, the fan, when thrown overboard, and being sufficiently left behind to tighten the chain, it immediately began to revolve with very considerable rapidity, and with such power as to work with steadiness a double-actioned 6-inch pump, which discharged water from the well of the flat, eleven and a half feet deep, in copious streams. This action was continued for about an hour, and every thing connected with it worked in the most satisfactory manner. While the experiments were in progress, the flat was towed by a steam-tug, and in proportion to the rate at which the towing was carried on, the rate of working the pumps became faster or slower. Calculation shows that the resistance offered by the fan to the progress of the vessel was equal to the hundred and fiftieth part of the power required to propel her. In other words, supposing a 500 ton ship to be going at the rate of six knots an hour during the whole voyage to Calcutta, and to have the fan in operation all the way, the retardation of the ship's progress would be about sixteen hours.

Marine engineering as a branch of Scottish industry continues to exhibit a high degree of prosperity. Last year 88 iron vessels were turned out by the Clyde builders, the gross tonnage being 47,700 tons; and there are now on the stocks 46 vessels, with a tonnage of 44,000 tons. The death is announced of Mr. J. Wood, a gentleman who did much in the course of an active business career, extending over 50 years, to raise the reputation of the Clyde in connection with the construction of steam vessels. Mr. Wood, who latterly became a partner in the firm of Messrs. J. Reid and Co., built the *James Watt*, which was the first seagoing steamer. Mr. Wood was in his seventy-third year. There is no one acquainted with the progress of steam navigation who does not know that the reputation which the Clyde enjoys for the beauty and symmetry of its vessels it inherits wholly from Mr. John Wood, who first set the fashion which other builders have followed; and we are persuaded that there is not one of these builders who will not be anxious himself to proclaim this truth, so unanimous is the sentiment entertained of the eminence of Mr. Wood's talents, and of the deep debt due both to his example and his liberality, for it was one of Mr. Wood's distinctions that his stores of knowledge, his shrewdness, and his fine taste, were always at the command of others engaged in the same business as himself, and, indeed, of the public at large; and he appears rather as the apostle of a new and better creed in naval architecture than as the possessor of a superior standard of knowledge, which he sought to use for his own exclusive advantage. And if by this distinction Mr. Wood conferred eminent public benefit, so should its recollection inspire corresponding public gratitude, and heighten the regret with which we now hear of his decease. Mr. John Wood was born on the 10th of October, 1788, and learnt the elements of his profession from his father, who was also a shipbuilder in Port-Glasgow, and a man of much talent and ingenuity. About 1806 he was placed under Mr. Brocklebank, shipbuilder in Lancaster, for two years. At this time Lancaster enjoyed a considerable reputation for shipbuilding, and it was with the view of profiting by any superior knowledge there to be acquired that Mr. Wood served a part of his apprenticeship at that place. In 1811, on his father's death, Mr. Wood assumed the responsibilities of the building-yard at Port-Glasgow, having for a year or two previously been actively engaged in the management of the work. One of his first engagements was the construction of the steamer *Comet* for Mr. Henry Bell, which had been contracted for by his father. He subsequently built an immense number of river steamers, and steamers for deep-sea navigation. One of the most celebrated of the latter, at the time, and in every way successful (though the first of sea going steamers), was the *James Watt*, which he built in conjunction with his brother Mr. Charles Wood, to open a steam communication between London and Edinburgh. In the middle portion of his career he was chiefly engaged in building deep-sea and ocean steamers. By him the reputation of the Clyde as a field of production for steam vessels was raised to the highest pitch, and other Clyde firms participated in the reputation thus brought to their doors. Of late years Mr. Wood has built few wooden ships, partly from the fact of these having fallen much into disuse, and partly from his having become a partner of his relative, Mr. John Reid, shipbuilder, Port Glasgow, and, as such aided in raising the firm of Messrs. John Reid & Co. to the high reputation it now enjoys. From this firm he retired some years ago. Mr. Wood's brother, Mr. Charles Wood, who died a few years ago, was for some time associated with him in business; and he, too, was a very remarkable man, but, perhaps, too far in advance of the age in which he lived. Among his other designs, he projected and constructed the great ship-rafts, *Columbus*, and *Baron of Renfrew*, as a new expedient for bringing timber to this country. Although the latter of these was lost, the soundness of the principle may be held as established, from the fact that the former reached this country in safety. There can be no doubt that these brothers have, by their talents and other gifts, conferred honour upon their profession, and have added to the lustre of their native land.

Boat-Building by Machinery. — Recently the Duke of Somerset, accompanied by Rear-Admiral Lord Clarence Paget, C.B., M.P., Captain Charles Eden, C.B., and Captain John Moore, C.B., proceeded to a factory in the vicinity of Regent's Park, for the purpose of viewing and inspecting some very ingenious machinery, the invention of a clever American gentleman. The object sought to be obtained is the saving of time, labour, and expense in boat-building; and when we state that, by the process in question, a cutter of 36 ft. in length can be turned out of hand ready for the water in 10 hours, we have said enough to show the extraordinary character of the means used to produce such a result, especially when it is considered that the same work performed by the process now in existence, could not be finished under eight days.

The French Navy.—The French Government are actually building steam vessels at St. Cloud for the Imperial Navy. They have just launched from opposite the park, a screw dispatch boat called the *Argus*. She was commenced only in May last, but from 150 to 200 workmen have been constantly employed on her. The chief novelty attached to the *Argus* is connected with her boilers, which are chiefly heated by means of a jet of fire, carried into the water itself by means of a metal worm. The *Argus*, after having been subjected to various experiments before the Minister of Marine and a body of scientific engineers, will be sent to Cherbourg, there to be fitted out for sea.

Ornamentation of Cabinet Furniture.—An artist in Paris has made a discovery which will effect a complete revolution in the manufacture of cabinet-work. He has found a means of rendering any kind of wood so soft that it will receive an impression either of the most varied sculpture, or the most delicate chasing. The wood is then hardened to the consistency of metal, while the impression remains perfect. The artist has already completed some splendid sculptured articles, such as picture-frames, inkstands, chests, and liquor-stands. With the introduction of this new art, it is expected that articles of household furniture will be considerably reduced in price.

New Copper Coinage.—The metal of the new copper coins lately issued is composed of 95 parts of copper, 4 of tin, and 1 of zinc. The following table shows the comparative weight and sizes of the new coins and the coins of the preceding mintage.

	Weight.		Diameter.	
	Old C. in gr.	New C. in gr.	Old C., in.	New C., in.
Penny, ...	291·66	145·83	1·33	1·20
Halfpenny, ...	145·83	87·50	1·10	1·00
Farthing, ...	72·91	43 75	·86	·80

Transport Carriage for Heavy Guns.—A new transport carriage for the removal of heavy guns has been forwarded to Portsmouth for the purpose of testing its powers in the removal of large class ordnance to and from different parts of the works, and has been found to answer admirably, contrasting very favourably when compared with the old sling waggon. The new carriage is very simple in character, and consists of four parts. A pole and axle, with two wheels, with a projecting fork and upright pin over the axle; in fact, a "roller handspike" mounted on wheels. The pin, on the pole being raised, fits in a plate in the rear and under part of the slide of an eight-inch gun carriage, and by pulling down the pole, precisely as the handspike is used, the weight of the slide, carriage, and gun is taken off the ground and thrown on the fore axle of the transporting carriage. At the fore and under part of the slide, in a line with the fore chase of the gun, are fittings to receive an iron axle, which is clamped into its place and then fitted with its two wheels On ordinary roads the heaviest ordnance mounted on their carriage, and traversing slides may thus be transported to any distance.

Scottish Shipbuilding Association.—The December meeting of the Scottish Shipbuilding Association was held on Monday evening in the Queen's Rooms, James Rodger, Esq., Vice-President, in the chair. After the usual business, Mr. Duncan read a paper on "The Relative Proportions of Ships." He commenced by stating the influences which operate upon shipbuilders and shipowners in the construction of the various descriptions of shipping; commented upon the effect which the various tonnage laws had in developing peculiarities of form and proportions; stated the principles which science and experience would indicate as a proper basis for ship construction; and concluded by observing that the present system of measurement for tonnage, inasmuch as it was a correct measure of the capacities of ships, would do more to develope correct proportions and symmetrical adjustment of form, than any system of purely scientific deductions could possibly produce. After some pointed practical remarks from James Watson, Esq., of the Edinburgh Ropery Co., and some general conversation on the subject before the meeting, a vote of thanks was passed to the speaker and the chairman, and the meeting terminated.

Steam Ploughs.—The Emperor of the French has ordered of Mr. Dickoff, machine maker, of Bar-le-Duc, ten steam ploughs, to be constructed on Fowler's system, together with their engines of 12 horse-power. These ploughs, which are intended for experimenting on a large scale, are provided with two sets of implements, of four shares each, which come into action alternately, the one set which is out of action being elevated during the time, the other set is in action. A steam engine, stationed on one side of the field draws the plough by means of a wire rope, which is passed round a pulley fastened to what the inventor calls an anchor on the opposite side of the field. The anchor as well as the engine is shifted as often as the plough arrives at the headlands. Our contemporary the *Genie Industriel*, says:—"It is evident that where manual labour is scarce and horse food dear Fowler's system will be of great utility; thus in the Landes, and in Algeria, its application will be important, especially in clearing the land." In countries in which agriculture is not carried on to a great extent and where fuel is dear this system of course would not be found economical, it is as yet, moreover, far from being so simple as we could wish.

Westminster Palace Hotel.—This extensive structure is now completed It is a fine building, occupying an extensive frontage in Victoria Street, and overlooking the Houses of Parliament and Westminster Abbey. It is six stories high. The porch or entrance consists of an elegantly sculptured design, and the grand entrance has an opening over it to the roof, terminating in a skylight. The galleries are lighted by side windows. The public coffee-room is 90 feet long by 30 wide, the richly ornamented ceiling being supported by scagliola columns. Next it is the dining-room, 70 feet long, with numerous reception-rooms, a library, ladies' coffee-rooms, and smoking rooms. The other stories comprise sitting-rooms and suites of apartments, and some 120 bed-rooms and baths. The extent of the structure may be inferred from the fact that there are 700 rooms in all, 140 of them being occupied by the India Council. The cooking department, which already supplies the India-house, is on a scale commensurate with the other departments, and the general tariff is similar to those of the Great Western and Euston Hotels. The hotel, it is expected, will be a great accommodation to persons visiting London during the Parliamentary Session. Owing to the great height of the building and the consequent tedious ascent that would have to be made to get upstairs, an ingenious contrivance in the shape of a hydraulic lift has been designed, by means of which, seated on a sofa with their luggage, visitors may ascend and descend from or to any of the six stories at pleasure. The architects of the structure are Messrs. W. and A. Moseley, and the builders Messrs. Myers.

Coal Oil.—Important Patent Decision.—The James Young Coal Oil Patent again Sustained in Scotland.—At Edinburgh, Scotland, after a trial of six days, commencing on the 1st of November, before the Lord President of the Court of Session and a jury, between Mr. Young and his partners and the Clydesdale Chemical Co., for the infringement of Young's "Coal Oil Patent," the jury returned a verdict for the plaintiff on all the issues. As usual in such cases, the defendants set up that the process described in the patent was well known to the scientific world before the date of its alleged invention by Young. To support this, all the old fossil apothecary books, chemical works, encyclopædias, and French and English patents, of late so fatiguingly inflicted upon the public by Frank Storer and others, were dragged into Court, where a number of chemical experts (?) stood ready to swear, and did swear, that out of the old dry bones they could construct Mr. Young's living invention. Nevertheless, the judge and jury failed to recognise in the grinning skeleton, thus built up from the exhumed remains of decayed abortions, any likeness to the progeny of Mr. Young. These very disinterested and chemically learned expert gentlemen undertook to show that a sufficient description of the process was contained in a paragraph in Kane's *Chemistry*, but the author of the book, Sir Robert Kane, appeared on the stand, and swore not only that the article in the book would not fairly bear any such construction, but that he had no such idea when he wrote it, and that so far as his knowledge of the art and book extended, Mr. Young was the first discoverer of the process patented by him. To meet this, it was suggested "that Sir Robert Kane might have pointed it out in his book although not aware of having done so." This brilliant proposition did not altogether satisfy the Lord President, who remarked—in his charge to the jury—"Why, if he was not aware that he had done so, though he had written the book, you judge whether it was so pointed out, that is, was generally known. I don't know whether you will consider him the best exponent of his own book or not." This is only a small specimen of the ingenuity of these expert chemists, which seems to have had no other effect than to disgust both court and jury. Notwithstanding, the defence consisted of nothing more nor less than a repetition of Frank Storer's review of Dr. Antisell's work on *Coal Oil*, except the very small part that relates to Dr. Antisell and his book, it failed to convince either the Lord President or jury that Mr. Young's invention consisted in the advent of Boghead coal, or that for any other reason the patent was invalid. This time both judge and jury were of one mind, and the verdict may be regarded as finally and triumphantly establishing the validity of the patent both in Great Britain and in this country.—*American Gas Light Journal, Dec.* 1, 1860.

Civil Engineering and Mathematics.—Sir David Brewster, in his address in opening the winter session of the University of Edinburgh, of which he is Principal, made the following remarks on the necessity of mathematical attainments to civil engineers:—"Great Britain has always been distinguished among civilized nations for the magnitude and splendour of her public works; but it is a remarkable circumstance that the engineers who executed them were neither mathematicians, chemists, nor natural philosophers, but, generally speaking, persons of humble station, who, by habits of observation almost innate, by powers of discrimination almost intuitive, and by practical knowledge gathered in the workshop or acquired in manual labour, gradually rose to professional celebrity. Mr. Watt himself informed me that he never attended Dr. Black's lectures on chemistry, as has been alleged; that he had been unfortunately prevented, by the necessary avocations of his business, from attending any other lectures, and that he had a natural inaptitude for mathematics; and yet there was no one among the chemical and mechanical philosophers of his day whose knowledge of these subjects, within certain limits, was so varied and correct, and who had treasured up with equal care those irrefragable results which could be safely applied in the construction of great works. Mr. Telford also had not only an inaptitude, but a singular distaste, for mathematical studies, and be never even made himself acquainted with the elements of geometry. So remarkable, indeed, was this peculiarity that, when we had occasion to recommend a young friend as a neophyte in his office, and founded our recommendation on his having distinguished himself in mathematics, he did not hesitate to say that he considered such acquirements as rather disqualifying than fitting him for the situation. That this opinion, which is far from being an uncommon one among engineers, is not utterly groundless may be inferred from a comparison of the labours of some foreign engineers, who were great mathematicians, with those of Watt, Smeaton, Brindley, Rennie, Telford, and Isambard Brunel; but we are clearly of opinion that such a doctrine cannot be gravely maintained by any person who has viewed the subject in all its phases. If sound practical knowledge, and habits of accurate observation should be found incompatible with mathematical and physical attainments, we would at once pronounce in favour of 'science' as the distinguishing quality of the engineer; but we hold both to be essentially requisite in the construction of works in which the materials are exposed to the disintegrations of chemical and atmospherical agents, to the superincumbent pressure of solid and fluid bodies; to the action of complicated mechanical forces; to the direct assaults of the lightning and the tempest, and to various contingent pressures which require to be foreseen and resisted."

The "Bombyx Cynthia" on the Japanese Acacia in Europe.—The Japanese acacia was introduced into Europe by a French missionary in the seventeenth century, and it has grown and flourished in such abundance, accepting every species of climate, soil, and culture, spreading without the smallest care, and shooting to the height of twenty yards without nursing or attention, that, for this very reason, it has been looked upon with contempt, in spite of its light and graceful foliage, and the pleasant shade it affords. When the city of Paris, a few months ago, planted the Boulevards with this tree in consideration of these very qualities, calumny began to be busy with its name, and to declare that the thick heavy juices which distil from its branches at certain seasons of the year, instead of being the very soul and essence of the fine Japan varnish, was nothing more than a deadly poison which would blister and ulcerate the skin, render the fairest complexion unsightly in a single night, and make the most angelic countenance pucker and fester with the most frightful pustules before the morning. No need to say after this how the poor tree was abused and vilified. An exaggerated dread of its vicinity caused the passengers on the Boulevard to give it the widest berth possible, and either to creep close to the shops on the one side, or walk right into the middle of the road on the other. Things were in this state, when the planting of the square of the gardens of the "Conservatoire des Arts et Métiers" took place. It was suggested that the different candidates for the place left vacant by the failing mulberry tree should be planted all round, and the silkworm left to luxuriate on each, and a report made to the Académie as to the preference given. From time to time we have learnt that, with unaccountable perversity of taste, the Japanese acacia was the tree preferred, and upon its leaves was the *bombyx cynthia* revelling and fattening without a care in the world, while the savans of the Jardin des Plantes were watching progress with attentive eye, living on hope of a fine crop of cocoons, and a silk cravat from the produce. Meanwhile, a manufacturer, but no savant, tries the experiment with this one tree alone—succeeds in procuring, with the greatest ease, a coarse kind of silk in great abundance from the *bombyx cynthia* fed upon the Japanese acacia, and sends the result to the Exposition at Besançon—shames the Paris savans, and becomes, together with his *aylantine*—for this he calls the new produce—the talk and pre-occupation of the whole manufacturing and scientific world of France. The silk is less fine and brilliant than that spun from the mulberry silkworm, but it is stronger, and infinitely more abundant. In its general attributes it may be compared to a mixture of silk and cotton, and will be admirably adapted for the cheaper kind of silken fabric so much appreciated in England. This material seems to have been sent by Providence just at the very time when a substitute for the silkworm had become an absolute necessity; and the most brilliant hopes are founded upon its future perfection by Manchester invention and machinery. The Japanese acacia would grow freely in uncultivated soil in the south of England, and, spreading so quickly as it does, would be worth the attention of capitalists and manufacturers, who, with but little outlay, might be enabled in a very short time to realise immense profits.

Cuba and her Plantations.—The island of Cuba, in spite of Spanish misrule, is one of the most prosperous portions of the earth. Her present population is estimated at 1,130,000, of which nearly 550,000 are white inhabitants, 180,000 free coloured, 400,000 slaves, and 38,000 Asiatics and Indians. The sugar estates are immensely productive. Twenty-three of the principal plantations, comprising about 100,000 acres of land and 10,175 slaves, are valued at £3,000,000. These 23 estates produced in 1859, 235,000 boxes, the worth of which was £4 each box, making in all £940,000. There are 1,600 sugar plantations in Cuba, the exported products of which amount to about £10,000,000 per annum.

Algiers for the Consumptive.—The French journals report that Dr. Pietrasanta, who was intrusted some time ago with a mission to Algeria, in order to study the influence of that climate in chronic pulmonary complaints, has now communicated the result of his inquires to the Academy of Sciences. Dr. Pietrasanta commences by stating that the climate of Algiers is a medium between those of the temperate and tropical zones. Its atmosphere is extremely pure and cloudless. Twilights are very short. The seasons differ but slightly from each other, the annual average temperature being 66½ deg. Nevertheless, great variations are suddenly experienced at times; the hygrometric state of the air is moderate, and the average altitude of the barometer, 762·32 millimetres, (about 30 inches). There are, moreover, certain periods of wind and rain which are well determined. Regarding population, the increase is determined, first, by immigration (arrivals being always more numerous than departures), and then by a diminution of mortality, and an increase in the number of births. Wherever insalubrity exists in Algeria, it is generally removable by human ingenuity and industry. Pulmonary complaints, however, do exist in Algiers. Dr. Pietrasanta considers that they are chiefly owing, first, to a contempt of hygienic practices; and secondly, to the influence of libertinism, which the natives have borrowed from the Europeans. The following six propositions convey the results of these investigations:—1. The climate of the city of Algiers is extremely advantageous to patients labouring under pulmonary affections. 2. Consumption exists at Algiers among immigrants as well as among natives, but it is much rarer than in France and on the coasts of the Mediterranean. 3. The increase of consumption among the natives, whether Arabs, Mussulmans, or negroes, is independent of any climatological cause. 4. The climate of Algiers is extremely favourable in cases of predispositions to be conquered, or symptoms to be removed, which constitute the first stage of phthisis. 5. Its beneficial influence may be questioned on the second stage of tuberculosis, especially when general symptoms predominate over local injuries. 6. It is fatal in the third stage as soon as disorganisation appears.

IRON IN LINCOLNSHIRE, AND STEEL IN NEW ZEALAND.—In the course of the past twelve months attention has been occasionally called to the development of mineral wealth in Lincolnshire. It may now be stated that a "Kirton-in-Lindsey Iron Ore Company" has been organised; that ore is being shipped regularly from Grimsby to the Tees, the Hartlepools, and the Tyne; and that the company have completed a branch line of the Manchester, Sheffield, and Lincolnshire Railway into one of their pits, and are about laying a tramway into others. When the arrangements in progress are completed, the company expect to be able to forward to the northern blast furnaces as much as 1000 tons of iron ore per day. It appears from some observations made by Mr. Sollitt, analytical chemist, that the ore contains from 49½ to 64¾ per cent. of metal of a quality so fine that it rivals the Swedish ores employed in the cutlery manufacture—in fact, Mr. Sollitt pronounces the ore the finest he has ever seen. —We are told of the existence in New Zealand of a large extent of sand, which when smelted yields 66 per cent. of pure steel, and that half a dozen persons in London have subscribed the requisite capital to work a grant of the district which has been obtained. Some experiments have been tried with samples, and it is stated that a poinard made from the produce was driven through two penny pieces, one over the other, without any injury to the edge. One fear to be entertained in such cases is lest the mass should not be found the same as the transported samples, but as in this case the public are not being appealed to for the formation of a company, our caution is unnecessary.

SIGNAL LAMPS.—Mr. Ward's night signal lamps, having been considerably reduced in size and weight, were again brought forward for experiments at Woolwich by order of the Board of Admiralty. A committee of officers attended the experiments. The lamps, four in number, were hoisted in line in the rigging of the flagship, and were operated for signals under the superintendence of Mr. Thomas, while the effect was witnessed from various parts of the dockyard. During the late trials on board the Royal Albert, at sea, it was suggested that the weight of the lamps—40lb. each might be some impediment in the hands of the sailors to the free and speedy transmission of the signals, and more especially during a heavy sea. The lamps are accordingly reduced to a fifth of the former weight—8lb. each, while the signal power is as strong and perceptible as before; and, together with the appurtenances, the complete set of four lamps was yesterday contained in a neat and compact tin case, the exterior dimensions of which were stated to be less than 12 inches square. Other important alterations have also been made, so that the one hoist can now be given in classes from 1 to 7 entire, making a total of 178 signals without the working lines, a convenience never before attained in the code of night signals. The night signals are now complete without the use of blue lights, rockets, false fires, and guns, which were complained of as being slow and tedious, and in war could not fail of attracting the enemy's attention. The improvements were admitted to be extremely important, and the committee united in congratulating the inventor on the success which he had finally accomplished, and expressed their opinion that no further alteration nor improvement could be desired.

WHAT OUR ANCESTORS THOUGHT OF THE GROWTH OF LONDON.—At the present moment, when the Thames, within the limits of the metropolis, is crossed by at least a dozen bridges, whilst others are in course of erection, more contemplated, and the crowning work of all, a magnificent embankment on the north side is projected, and we hope of no distant accomplishment, it is curious to observe the light in which our forefathers regarded such undertakings, when London was accessible from the south by one bridge only, when as yet railroads were undreamt of, M'Adam was not, and the journey to York occupied a fortnight. We indulge in these remarks as a prelude to the following debate which took place in the House of Commons, on the 4th of April, 1671:—The second reading of a bill for building a bridge over the river at Putney having been moved, Sir Wm. Thompson said:—"Mr. Speaker: London is circumscribed—I mean the city of London. There are walls, gates, and boundaries, the which no man can increase or extend. Those limits were set by the wisdom of our ancestors, and God forbid they should ever be altered. But, sir, though these landmarks can never be removed—I say never, for I have no hesitation in saying that *when the walls of London shall no longer be visible, and Ludgate is demolished, England itself will be as nothing*—though these landmarks are immoveable, indelible, indestructible, except with the constitution of the country, yet it is in the power of speculative theorists to delude the minds of the people with visionary projects of increasing the streets of the city, so that it may *even join Westminster!*" Then follows Mr. Boscawen, an ancestor of the Cornish admiral of that name, as well as of the Earls of Falmouth. "If," said he, "there were any advantage derivable from a bridge at Putney, perhaps some gentleman would find out that a bridge at Westminster might be a convenience. Then other honourable gentlemen might dream that a bridge from the end of Fleet-market into the fields on the opposite side of the water would be a fine speculation; or, who knows but at last it might be proposed to arch over the river altogether, and build a couple more bridges, one from the palace at Somerset House into the Surrey marshes, and another from the front of Guildhall into Southwark!" This idea, it is recorded, was received by the house with "great laughter," so palpably absurd did it appear to an enlightened legislature. But Mr. Boscawen proceeded in the same ironical vein, and with the same marvellous prescience, as events prove, to observe, "Perhaps some hon. gentlemen who are interested in such matters will get up in their places and propose that one or two of these bridges shall be built of iron!" At which the house became absolutely convulsed, and gave vent to their sense of the ridiculous by "shouts of laughter." The hon. member now waxed warm, and declared with indignation, "for my part, if the bill passes, I will move for leave to bring in half-a-dozen bills for building bridges at Chelsea, Hammersmith, Marble Hall Stairs, and Brentford, and at 50 other places besides." After Mr. Boscawen had sat down, up started Mr. Low, who said that it was the opinion of the worthy chief magistrate that if any carts went over Putney Bridge the city of London was inevitably ruined; and added that the river above London Bridge would be totally destroyed as to navigation. The debate was wound up by Sir Henry Herbert, who seems to have entertained some opinions which were a little in advance of his time, in these terms: "I honestly confess myself an enemy to monopolies. I am equally opposed to mad visionary projects; and I may be permitted to say that in the late King's reign, several of these thoughtless inventions were thrust upon the house, but most properly rejected. If a man, sir, were to come to the bar of the house and tell us that he proposed to convey us regularly to Edinburgh, in coaches, in seven days, and bring us back in seven days more, should we not vote him to Bedlam? Surely we should, if we did him justice; or, if another told us that he would sail to the Indies in six months, should we not punish him for practicing upon our credulity? Assuredly, if we served him right."

Had George Stephenson this threat and the fear of Bedlam before his eye, when he told a committee of the House of Commons with such wise caution that *he believed* he could drive an engine and carriages upon a tramway at the rate of 12 miles an hour, and that a speed of 15 might even be possible?

SECULAR CHANGE OF THE EARTH'S ORBIT.—Does the general change in our climate arise in any way from what are now—although but recently—technically known as the secular inequalities of the orbit of the earth? Their bearing upon the general change of climate, which some geologists recognise and attribute to a great variation in the obliquity of the ecliptic, has been recently looked to by M. Leverrier, the eminent French astronomer. Independently of those inequalities in the orbits of the planets which are termed "periodic," and which go through their variations in a few hundred years at the utmost, there is a class requiring periods of vastly greater length for their entire exhibition, which are yet within the grasp of the physical astronomer, who can define their limits without the chance of material error. They arise from the slow but accumulative attraction of the planetary system upon each of its members, whereby in a cycle of immense duration every orbit is more or less disturbed, though from the nature of the perturbations the planes and eccentricities are necessarily kept within certain limits. This disturbance it has been M. Leverrier's object to define. In the case of the earth, it is shown by the French mathematician that the greatest possible deviation of the plane of the orbit from the position it occupied in 1800 is 4 deg. 52 min. one way or the other, and it is easy to see, from the form adopted in the calculations, that this result is not liable to an uncertainty of more than five or six minutes. Hence it follows, that the greatest possible distance of the tropics from the equator is 28 deg. 20 min., and the least 18 deg. 36 min. The eccentricity is found to attain a *maximum* included between the limits 0·06 and 0·08, the most probable value being 0·078; consequently, assuming the earth's mean distance from the sun to be 95,365,000 miles, the difference between her greatest and least distances may amount to nearly 15,000,000 miles; while, on the other hand, there is apparently nothing to prevent her orbit becoming, for a time, sensibly circular. This, however, will not take place during the present oscillation. After the lapse of about 24,000 years from this epoch, a *minimum* of 0·003 will be attained, whereby the difference between the earth's extreme distances will be reduced to 500,000 miles. The following table, exhibiting the distances of the tropics from the equator, and the effect of the ellipticity of the earth's orbit upon her distance from the sun, for periods of 10,000 years, reckoning backwards from 1800, is founded upon M. Leverrier's theory:—

Years before 1800.	Distance of the Tropics from the Equator. Degs. m. s.	Differences between the Earth's greatest and least Distances from the Sun. Miles.
100,000	19 42 24	9,022,000
90,000	20 45 36	8,621,000
80,000	22 8 56	7,59t,000
70,000	24 41 53	6,027,000
60,000	26 4 37	4,158,000
50,000	27 8 6	2,499,000
40,000	27 30 56	2,079,000
30,000	27 9 46	2,880,000
20,000	26 12 7	3,586,000
10,000	24 52 30	3,567,000
0	23 27 55	3,204,000

It is evident, from the above, that the astronomical conditions which affect climatology have never undergone, nor will ever suffer, a change of such magnitude as would lead to the subversion of the present order of things.

GLASGOW SCHOOL OF MINES.—Scotland, the very nursery, as we may term it, of mining operations, has, until recently, done little or nothing in the way of fostering education in connection with the practice of mining. Now, however, Glasgow does possess a school of mines, wherein a course of real training is being pursued, under the superintendence of Mr. Mark Fryar of Bristol. In conjunction with Mr. Fryar, the committee have arranged the hours of instruction so as to accommodate the students who were likely to attend, and accordingly fixed that there should be two classes each day for five days in the week. The first class, which is principally attended by young men who are not altogether dependent upon their exertions for support, and by workmen who are engaged in the collieries during the night, commences at 10 o'clock A.M., and continues till one o'clock P.M. The afternoon class, attended for the most part by operatives who work in the mines in the neighbourhood of Glasgow during the early part of the day, commences at three o'clock P.M., and continues to six o'clock P.M.

The scale of charges has been fixed as follows:—For workmen, sixpence per week; and for others, not relying upon their own efforts for support, six guineas per annum.

Five-sixths of the students are workmen engaged in and about the mines, who, at considerable sacrifice and inconvenience to themselves, have been constant in their attendance, affording a very satisfactory proof of the wish for instruction by that class of men.

The following are the subjects to which the attention of the students has been principally directed during the past session:—

1. Mechanical and other drawings illustrative of mine engineering.
2. Methods of working coal and other minerals.
3. Ventilation of mines.
4. Timbering, and other means of supporting the roof underground.
5. Transport of minerals above and below ground.
6. Means of searching for coal by a geological examination of a district, and by the various methods of boring.
7. Sinking, walling, tubbing, and barring of shafts.
8. Drainage of mines by levels and machinery.
9. Construction of dams in mines.
10. The principle and construction of the steam engine.
11. Mineral surveying, levelling, and plan and section making.

Preparatory to the general examination, two sub-committees were appointed; one to examine the plans and report on the progress made by the students in "mechanical and other drawings, illustrative of mine engineering;" and the other to inquire into and report as to the knowledge of the students in the "various branches relative to practical mine engineering professed during the session."

The reports of these sub-committees are of great service in deciding on the progress and merits of the students, and the result may be summed up as follows:—

Students who have distinguished themselves in mechanical and other drawings relating to mine engineering.

Taking into consideration that some of the students attended the class-room all day, and others only part of the day, after coming from their work at the pits, the committee deemed it proper to separate them into two divisions, placing those who attended the class-room all day in the first division, or section A, and those who attended only part of the day in a second division, or section B. Accordingly, the five best have been selected out of each division.

Section A.

1. James Anderson, Baillieston.
2. David Bryden, Sundrum.
3. Hugh Begg, Auchinleck.
4. John Carswell, Wishaw.
5. Matthew Clelland, Chapelhall.

Section B.

1. Robert Stevenson, Chapelhall.
2. Thomas Thomson, Nitshill.
3. John Park, Old Farme, Rutherglen.
4. Thomas Gibb, Newarthill.
5. Archibald Cunningham, Kilwinning.

Students who have distinguished themselves for their knowledge of the various branches relating to practical mine engineering, proposed during the session.

It was deemed proper, also, to divide these into two classes, although not for the same reason as given above, in regard to the students in drawing—those placed in the first class having given the most satisfactory replies to the various questions submitted.

1st Class.

James Anderson, Baillieston.
Hugh Begg, Auchinleck.
John Carswell, Wishaw.
A. Cunningham, Kilwinning.
Matthew Clelland, Newarthill.

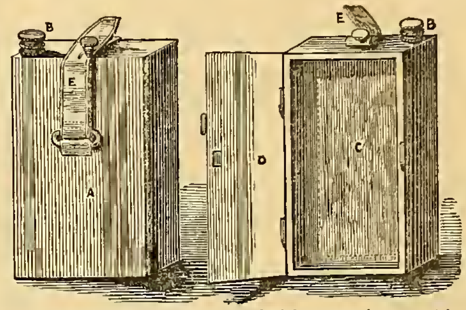
2d Class.

David Bryden, Sundrum.
John Wyper, Newarthill.
Robert Colquhoun, Skaterigg, Renfrew.
Walter Cairns, Crossgates, Fifeshire.
Robert Stevenson, Chapelhall.

After the examination, Mr. Merry, the Chairman, addressed the students as follows:—Students,—Having from the first taken an interest in the institution of a school of this kind in Glasgow, I have much pleasure in being present at this its first examination, and in witnessing the progress made by the scholars in the study of the several branches relating to the management and working of collieries and other mines, so ably taught by Mr. Fryar. The working of minerals will gradually become more difficult, and consequently more expensive, unless counteracted by the appliances of science, combined with the skill and perseverance of the practical men,—for it is well known that in this, as in many other mineral districts, the easiest got seams of coal and ironstone are always the first wrought, leaving to those who may come after to sink deeper pits, pump more water, and work thinner seams. It is, therefore, of the utmost importance—not only for the well-being of the mining interest, to which you and I belong, but for the good of the community at large—that young men, intending to become owners or managers, should have the means of obtaining instruction in the theory and practice of mine engineering. It appears to me that the leading points to be attended to are—(1) How to work and raise the minerals in the most economical manner; (2) The best mode of ventilating the mines and freeing them of water; and (3) The contrivances and arrangements, above and below ground, for the safety and health of the workmen. From the progress you have already made, and from this day's proceedings, I am led to hope that a good beginning has been made, and it will always afford me pleasure to promote in any way within my power the objects in view. In a country abounding with mineral treasures like Scotland, such a scheme as this must be productive of an enormous amount of good.

Volunteer Flask and Sandwich Box.—The accompanying illustration represents an exceedingly portable and useful addition to the equipment of the volunteer, viz., a combined flask and sandwich box. This novelty has been introduced by Messrs. Thomas Harding and Sons, of Regent Street, London, who have protected it by letters patent. Fig. 1 represents the flask and sandwich box closed, and fig. 2 shows the same open. It consists of a rectangular case, made of a colour to suit the uniform of the wearer. This case is divided into two compartments, one of which compartments, A, forms the spirit flask, the opening to which is closed by a screwed cap at B.

Fig. 1. Fig. 2.



The front compartment, C, is appropriated for the sandwiches, and is closed in by the lid, D. A strap, E, fitted to the back of the flask, and fastened by a stud on the top, admits of its being suspended snugly to the waist belt, and at the same time, it may be readily detached therefrom when required for use. This convenient arrangement for carrying a supply of refreshment will be found invaluable to volunteers after a long march, or the fatigues of a field day.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded August 28, 1860.

2075. Frederick C. Calvert, Manchester, Lancashire—Collecting and saving certain products given off or emitted during the manufacture of coke.

Recorded September 6.

2150. Charles A. Schneider, Albany Street, Regent's Park—Improvements in manufacturing letters, numerals, arms, designs, trade-marks, mosaic and other ornaments to be attached to glass or other smooth surface.

Recorded October 13.

2491. Mary Hutchison, Glasgow Lanarkshire—Improvements in the manufacture of lubricating oil.

Recorded October 15.

2508. George F. Goble and Frederick S. Hemming—Improved machinery for crushing quartz and other substances, and for mechanically and chemically extracting gold from auriferous stones or soils, and for procuring silver, copper, zinc, lead, iron, and other metals, from their respective ores or impregnated liquids.

Recorded October 22.

2572. Andrew Dietz, New York, U.S.—A new and useful method of treating skins and hides during or after the process of tanning or finishing them, and of aiding the tanning of hides or skins.

Recorded October 26.

2614. Robert Tiernan, Liverpool, Lancashire—Improvements applicable to infants and invalids' feeding bottles, and other purposes.

Recorded October 27.

2624. Edward Booth and Major Booth, Manchester, Lancashire—Improvements in machinery or apparatus for finishing cotton, linen, silk, and other fabrics and materials.

Recorded October 31.

2661. Thomas G. Chislin, Southampton Row, Russell Square, St. George-the-Martyr—Preparing, applying, and adapting certain articles of vegetable production called eiklonia-buccinalis, proteaceæ, juncus serratus, juncus trista, and amaryllideæ, to further new purposes of manufacture.)

Recorded November 2.

2679. Jules C. Delarothiere, South Street, Finsbury—Some improvements in stocking-frames.

2690. William E. Newton, Chancery Lane—An improved press for compressing substances for packing in the form of bales, or for other purposes.—(Communication from Jordan Eckel, New York, U.S.)

Recorded November 3.

2698. Richard B. Pilliner, Hatfield Street, Stamford Street, Blackfriars Road, Southwark—Improvements in machinery for compressing black lead or other suitable substances, part of which improvements are also applicable to packing various other materials.

Recorded November 6.

2732. Edward Salisbury, Preston, Lancashire—An improved mixture or solution to be applied to pickers, picking-bands, straps, sole leather, and such like materials in order to harden them and render them more lasting.

Recorded November 7.

2734. Paul W. Rennel, Plumbstead, Kent—Improvements in the method of, and apparatus for treating green, semigreen, or undried vegetables or plants, in order to reduce their fibrous portions to a pulp, and also in the application of the said pulp when so made, to the manufacture of paper.

Recorded November 8.

2748. Jean P. Fittere, Castelnau Magnoac, France—Improvements in portable sawing machines.
2749. Henry J. Distin, Great Newport Street, Leicester Square, and Angustus H. Siebe, Baker Street, Portman Square—Improvements in instruments for determining the movement of musical compositions, and which are also applicable for other purposes.
2750. William F. Henson, New Cavendish Street—Certain improved fabrics made entirely or partially of alpaca or mohair.
2751. John Rollinson, Pensnett, and William Rollinson, Brierley Hill, Stafford—An improvement or improvements in working the brakes of winding engines.
2752. Thomas P. Bennett, Gilnow Mills, near Bolton-le-Moors, Lancashire—Certain improvements in or applicable to mules for spinning.
2753 Francis Preston, Manchester, and Thomas Kennedy, Kilmarnock, Ayrshire—Improvements in projectiles for fire-arms and ordnance.
2754 George Simpson, Glasgow, Lanarkshire—Improvements in pumps.
2755 James Gillies, Glasgow, Lanarkshire—Improvements in valves for steam engines.
2756. John Aitken, Dalry, Ayrshire—Improvements in clocks.
2757 Alfred V. Newton, Chancery Lane—Improvements in the construction of sewing machines.—(Communication from William C. Hicks, Boston, U.S.)
2758 Edward Westhead, Manchester, Lancashire—Improvements in boiling or evaporating soap, saline solutions, or other liquid substances.

Recorded November 9.

2759. Charles Stevens, Welbeck Street, Cavendish Square—An improved machine for raising water.—(Communication from Jean B. Guignes, Marseilles, France.)
2760. John W. Wallis, Fenchurch Street—Improvements in book indexes.
2761. James Chesterman, Sheffield, Yorkshire—Improvements in tents, marquees, and other like articles, parts of which are applicable to umbrellas and parasols, also in machinery for manufacturing parts thereof.
2762. Daniel B Lewis, Cheltenham, Gloucester—Improved apparatus for propelling steam vessels.

Recorded November 10.

2763. William Spence, Chancery Lane—Improvements in breech loading fire-arms.—(Communication from Edward Maynard, Washington, Columbia, U.S.)
2764. William C. Forster, Gibson Street, Lambeth, Surrey—An improved method of manufacturing soluble silicate of potash.
2765. Fortune Trouve, Rue du Bouloi, Paris—A system of publicity called 'Memento agenda,' otherwise an illustrated general cabinet and pocket agenda.
2766. Thomas B. Daft, Queen's Square, and William Pole, Storeys Gate, Westminster—Improvements in the fish joints of railways.
2767. John Glen, Glasgow, Lanarkshire—Improvements in machinery, apparatus, or means for engraving or producing printed surfaces.
2768. Edward B. Wilson, Parliament Street, Westminster—Improvements in the manufacture of railway wheels, tyres, axles, and points and crossings, which improvements are also applicable to the manufacture of ordnance, tubes, and metal cylinders generally.

Recorded November 12.

2769. John T. Pedder, Murray Street, New North Road, Hoxton, St. Leonard's, Shoreditch—A machine for the preservation of life in case of fire in dwelling houses and other buildings.
2770. Frederick Walton, Haughton Dale, Denton, near Manchester—Improvements in insulating telegraphic conductors.
2771. Hiram E. West, Attleborough, Massachusetts, U.S.—A machine for pressing and shaping straw hats or various other articles of like character.

Recorded November 13.

2772. Valentine V. Williams, Crosby Row, Walworth Road, Surrey—An improved method of constructing stands for cameras, telescopes, surveying and other instruments, parts of which are applicable to other purposes.
2773. John Wood, Manchester, Lancashire—Improvements in threading needles for embroidering machines, and also an improved method of working the same.
2774. David Thomson, Grosvenor Road, Pimlico—Certain improvements in rotatory pumps, for raising water and other liquids.
2775. Marc A. F. Mennons, Rue de l'Echiquier, Paris—An improved manufacture of coverings for the head.—(Communication from Gustave V. Roger, Crouy-sur-Ourcq, France.)
2776. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Improvements in the motive mechanism of cabinet organs, and other cylinders of musical instruments of that class.—(Communication from Lodovico Gavioli, Paris.)
2777. Mathieu L. Henriouett, and Leopold O. Bohlique, Rue de l'Echiquier, Paris—Improvements in the treatment of fossil and other mineral phosphates of lime.
2778. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Certain improvements in the construction of organ pipes.—Communication from Claudio Gavioli, Paris.)
2779. Joshua Williams, Saint Anne's Street, Salisbury, Wilts—An improved method of obtaining and applying motive power.
2780. Alfred V. Newton, Chancery Lane—An improved construction of feathering paddle wheel.—(Communication from Bryon Densmore, Brockport, Monroe, New York, U.S.)
2781. William Roberts, Millwall, Poplar—Improvements in pumps.
2782. Thomas Hughes, Wolverhampton, Staffordshire—An improvement in spitoons.
2783. John Juckes, Newgate Street—Improvements in stoves and fire places.
2785. Andre Deroide, and Vital Dupouy, Paris—An improved method and apparatus for bleaching all descriptions of vegetable textile fabrics and yarns.

Recorded November 14.

2787. William Brookes, Chancery Lane—Improvements in means or apparatus employed in weaving.—(Communication from Julius Boeddinghaus, Elberfeld, Prussia.)
2788. Robert W. Waithman, Bentham, York, and Joseph Waithman, Manchester, Lancashire—Improvements in the manufacture of cords, twines, and similar articles, and in the machinery or apparatus employed therein.
2789. Richard Furnival, Manchester, Lancashire—Improvements in machinery or apparatus for cutting paper, textile fabrics, and other articles or materials.
2790. Frederick E. Sharp, Gloucester Terrace, Blackheath, Kent—An improved portable rifle battery.—(Communication from Thomas Martin, Aden.)
2791. William Robertson, and John M. Hetherington, Manchester, Lancashire—Certain improvements in mules for spinning.
2792. James S. Crosland, Johnson Brook, near Hyde, Chester—Certain improvements in steam engines.
2793. Theophilus A. Blakely, Holywood, Down—An improved method of increasing the strength of steel and wrought iron.
2794. Robert H. Gratrix, Salford, Lancashire — Improvements in obtaining colouring matters for dyeing and printing.—(Communication from Matthias Paraf, Thaun, France.)
2795. Samuel Ling, Heywood, Lancashire—Improvements in apparatus for lubricating steam engines.
2796. James A. Bruce, Leamington, Warwickshire, and George H. Cottam, Old St. Pancras Road—Improvements in hay racks.
2797. John F. Reeves, Walpole Street, Chelsea—Improvements in the manufacture of paper.

Recorded November 15.

2798. John Schofield, and Miles Schofield, Oldham, Lancashire—Certain improvements in machinery or apparatus for doubling yarns of cotton or other fibrous materials.
2799. John Matthews, Burton-upon-Trent, Staffordshire—Improvements in brewing.
2800. John Crooke, Manchester, Lancashire—Certain improvements in the method or means of packing bales of goods or merchandise by means of the hydraulic press.
2801. Philip Unwin, John Unwin, and John U. Askham, Rockingham Street, Sheffield, Yorkshire—A saloon barrel pistol knife.
2802. Alexander Henry, Edinburgh—Improvements in rifled fire-arms.
2803. George Bagshaw, Preston, Lancashire—An improved arrangement of the flues of steam boilers for consuming smoke.
2804. William H. Ralston, Keele, Staffordshire—Improvements in the manufacture of soda ash.
2805. George R. B. Amott, Queen Street, Ross, Herefordshire—An improved plough, with mortise chisel, and plough iron combined.
2806. Alfred V. Newton, Chancery Lane—Improvements in sewing machines.—(Communication from Dwight Tracy, Worcester, Massachusetts, U.S.)
2807. Richard A. Brooman, Fleet, Street—An improvement in the manufacture and in the welding of steel and wrought and cast iron.—(Communication from Charles Funk, Paris.)
2808. Richard A. Brooman, Fleet Street—Improvements in sword bayonets and other swords.—(Communication from Francois Jules, Manceaux.)
2809. John Ridley, Stagshaw, Northumberland—An improved method of effecting the combustion of fuel, and of products arising therefrom.
2810. George Gill, Francis Street, Newington, Surrey—Improvements in 'steam rams' and other 'ships of war,' for the purpose of doing away with the necessity of employing rifled cannon, or other 'long range ordnance,' against armour plated and other ships in maritime engagements.

Recorded November 16.

2811. Charles Stevens, Welbeck Street, Cavendish Square—Improvements in sheet-iron tiles.—(Communication from Count du Vigier, and Viscount du Vigier, de Mirabel, Paris.)
2812. Jean C. M. Beziat, Rue de Malte, Paris—Improvements in the means or apparatus employed for permitting, stopping, and regulating the passage of steam, water, and gas.
2813. Charles W. Williams, Liverpool, Lancashire—Improvements in steam boilers for increasing the evaporative effect thereof, applicable also to stills and other like vessels or apparatus.
2814. Henry G. Drewe, Chelsea—Improvements in propelling vessels, and in the apparatus or mechanism for the same.
2815. Joseph Stockley, Newcastle-on-Tyne, Northumberland—Improvements in apparatus for grinding, smoothening, and polishing plate glass.
2816. Jean B. Mourguet, Rue Boucher, Paris—Improvements in fire-arms and ordnance and in projectiles used therewith.
2817. Edward B. Wilson, Parliament Street, Westminster—Improvements in the manufacture of railway wheels, and other articles of cast steel or malleable cast iron.
2818. Rudolph Bodmer, Thavies Inn, Holborn—Improvements in machinery or apparatus for folding, and for folding and stitching sheets of paper and other materials.—(Communication from Dr. C. B. Gruner, and Dr. G. A. Keller, Switzerland.)
2819. Benjamin Fleet, East Street, Walworth, Surrey—Improvements in apparatus for cutting and rounding wood.
2820. Thomas Welton, New Compton Street, Soho, and Edward H. C. Monkton, Parthenon Club, Regent Street—Improvements in the application of electricity or magnetism to the human body for the relief of pain and cure of disease.
2821. Richard A. Brooman, Fleet Street—Improvements in joining or connecting together pipes and tubes.—(Communication from Louis A. Farjon, Paris.)
2822. William H. Woodhouse, Parliament Street, Westminster—An improved method of and instrument for, measuring distances.
2823. William L. Thomas, Southsea, Hants, and Henry P. de Bathe—Improvements in the construction of plates or shields for the purpose of resisting shot and other projectiles.
2824 Manuel L. J. Lavater, Guildford Street, York Road, Lambeth, Surrey—Improvements in portable or syphon filters.
2825. Mathias A. J. Dahmen, Park Road, New Peckham, Surrey—Improvements in treating vegetable fibrous substances in the manufacture of paper.
2826. George Glover, Queen's Square—Improvements in apparatus used in measuring gas.
2827. Alfred Morrison, Nottingham—Improvements in locks.

Recorded November 17.

2828. Jacob H. Radcliffe, King Street, Oldham, Lancashire—Improvements in lubricating or oiling vessels, and in apparatus connected therewith.
2829. Bewicke Blackburn, York Buildings, Adelphia, and Henry Carr, Victoria Street—Improvements in axle boxes.
2830. Thomas M. Jones, Finchley Common—An improved apparatus for containing, igniting, and holding wax taper and other matches.
2831. Alexandre L. Leveque, France.—An improved apparatus for carburating or naphthalizing lighting gas.
2832. Hugh M'Farlane, Glasgow, Lanarkshire—Improvements in cameras such as are used by photographers.
2833. Barnabas Barrett, St. Giles Road, Norwich—Improvements in the treatment of natural and artificial stone, and in the manufacture or production of artificial stone.
2834. James Hogg, elder, and James Hogg, younger, and John Hogg, Edinburgh, —Improvements in ornamenting the edges of cloth bound books.

Recorded November 19.

2835. Henry Ford, Birmingham, Warwickshire—Improvements in coating or enamelling paper, pasteboard, cardboard, cloth, silk, and other similar fabrics.

2836. Henry A. Jowett, Sawley, Derby—Improvements in the method of heating or firing ovens for the manufacture of pottery and porcelain by means of gas, and in apparatus connected therewith.
2837. Origen Vandenburgh—Improvements in projectiles to be used in guns and ordnance, and improvements in the appliances for their projection.
2839. William Butlin, Northampton—Improvements in machinery or apparatus for stamping and ramming, to be chiefly applied to and used for the purpose of paving.
2840. William E. Newton, Chancery Lane—Improved means of, and apparatus for, supplying air to the furnace or furnaces, or to the fire-rooms of steam vessels by means of the paddle wheels.—(Communication from Louis Braudt, Indianola, Calhoun, Texas.
2841. Thomas T. Macneill, Mount Pleasant, Dundalk, Lowth, Ireland—Improved means of obtaining adhesion on railways for ascending inclines, and other purposes.

Recorded November 20.

2842. Richard A. Brooman, Fleet Street—Improvements in stoppers for bottles, jars, and other like articles, parts of which are applicable as fastenings.—(Communication from Louis A. Farjon, Paris.)
2843. John Hamilton, jun., Liverpool, Lancashire—Improvements in tubular wrought iron telegraph posts.
2844. Francis Pailing, Esher Street, Lambeth, Surrey—Certain improvements in fountain pens.
2845. Alfred V. Newton, Chancery Lane—An improvement in the construction of spring hinges.—(Communication from George B. Pierson, New York, U.S.)

Recorded November 21.

2846. Henry D. Pochin, Oakfield House, Salford, Lancashire—An improved material for building and other purposes.
2847. John Marland, Ivy Cottage, Hunslett, Leeds—Improvements in warping and sizeing yarn and thread.
2848. George H. Call, Southampton—Improvements in the manufacture of manure.
2849. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire —Improvements in the manufacture of boots and shoes, and of a new material to be employed therein, which material is applicable to various other useful purposes.—(Communication from Dufay Brothers and Company, Paris.)
2851. Henry Dearden, Rochdale, Lancashire—Improvements in machinery or apparatus for punching washers, for giving the necessary drag or friction to the spindles and bobbins of spinning machinery and similar purposes, and also in the method of using or working the said washers.
2852. John Crossley, Todmorden, Yorkshire—Improvements in means or apparatus for moulding iron or other metals.
2853. William Cooke, Charing Cross—Improvements in ventilating.
2854. James Howden, Glasgow, Lanarkshire — Improvements in steam engines and boilers, and in apparatus connected therewith.
2855. William Cope, William G. Ward, and Edward Cope, New Basford, near Nottingham —Improvements in lace machinery.
2856. Louis Heinemann, Broad Street Buildings—Improved means whereby engine drivers and persons in charge of, or attending to, railway trains may obtain intelligence or information for increased safety in travelling.
2857. Charles Myring, Wallsall, Staffordshire—Improvements in the manufacture of covered harness furniture, buckles, slides, and other similar articles, and in the machinery or apparatus to be employed in such manufacture.

Recorded November 22.

2858. Samuel A. Varley, York Place, and Cromwell F. Varley, Fortess Terrace, Kentish Town—Improvements in the regulation of heat, parts of the invention being applicable to other purposes.
2859. John Henry, Buchanan Street, Glasgow, Lanarkshire—Improvements in printing warps and in apparatus for the same.
2860. Thomas H. Kable, Margate, Kent—Improvements in fire-arms.
2861. William H. Ralston, Keele, near Newcastle-under-Lyme, Staffordshire—Improvements in the manufacture of hydrate of soda.
2862. Robert Jobson, Dudley, Worcester—Improvements in moulding articles of earthenware or porcelain, and in apparatus used therein.
2863. William F. Lovick, Thorpe, near Norwich, Norfolk—An improved bridal bit, which he terms a check-snaffle-bit, for restraining vicious or hard-mouthed horses with greater facility than with any other bit.
2864. Richard A. Brooman, Fleet Street—Improvements in apparatus for communicating continuous rotary motion from manual power. — (Communication from Guillaume A. Schnebard, and Ferdinand F. Bentel, Paris.)
2865. David Auld, Glasgow, Lanarkshire—Improvements in regulating the pressure and flow of fluids.

Recorded November 23.

2866. John Venables, Burslem, Staffordshire—An improved mode or modes of ornamenting the surfaces of earthenware, also applicable to the ornamenting of other useful articles.
2867. George E. Dering, Lockleys, near Welwyn, Herts—Improvements in the permanent ways of railways.
2868. James F. Carosin, South Street, Finsbury—Improvements in treating canetrash.—(Communication from Joseph F. Hugoulin, Island of Reunion.)
2869. Elliott Monkhouse, Caledonian Terrace, Cook's Ground, St. Luke, Chelsea—Improvements in the construction and manufacture, and the fixing or fastening, and the mobility, adjustment and re-adjustment of circular and polygonal heel-plates for boots, shoes, and clogs.
2870. William Manwaring, Banbury, Oxford—Improvements in the gearing of mowing and other light portable machines.
2871. Edward Kierby, Gatehead Mill, Greetland, near Halifax, Yorkshire—Improvements in covering, insulating, and preserving telegraphic wires and cables.
2872. John Coupe, Blackburn, Lancashire—Improvements in power looms for weaving.
2873. James Anderson, Farringdon Street—Improvements in preparing potatoes for boiling or cooking.
2874. Bartholomew Beniowski, Bow Street, Westminster—Improvements in the manufacture of types and in cases to be used therewith.
2875. Charles Humfrey, and Charles Humfrey, younger, Wareham, Dorsetshire—Improvements in distilling coal and peat, and bituminous and coaly minerals, and in the treatment of the products therefrom.
2876. George Bartholomew, Linlithgow—Improvements in boots, shoes, clogs, and goloshes.
2877. Edward Izod, and Robert Beech, Poultry—Improvements in the manufacture of stay cloth.
2878. Thomas Gamble, and Edwin Ellis, Nottingham—Improvements in machinery for producing loop fabrics.
2879. Thomas Hale, Barnsbury Row, Park Road, Islington, and Arthur Wall, Canton Street, East India Road—Improvements in the construction and internal arrangement of furnaces, and in the preparation, manufacture, and treatment of clays and bricks, and other articles made of clay, earthenware, or stone, used for the above and other structures.

Recorded November 24.

2881. Andrew A. Dalglish, Glasgow, Lanarkshire — Improvements in engraving or producing printed surfaces.
2882. William R. Bowditch, St. Andrews, Wakefield, Yorkshire—Improvements in the purification of coal gas and of coal oils.
2883. Robert Harrison, and George Taylor, Bacup, Lancashire—Improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.
2884. Christopher R. N. Palmer, Southampton, Hants—A new portable and improved fixed signal apparatus.
2885. Samuel Walker, Edghaston, Warwickshire—New or improved machinery to be used in the manufacture of twisted, reeded, and other ornamental metallic tubes.
2886. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in sewing machines.—(Communication from the Grover and Baker Sewing Machine Company, New York, U.S.)
2887. Thomas Benton, Sheffield, Yorkshire—Improvements in the manufacture of bells, and in alloys of metals to be used in the manufacture of bells.
2889. John Fowler, Robert Burton, and David Greig, Leeds, Yorkshire—Improvements in apparatus for raising, lowering, and hauling weights.
2891. Walter Leigh, Goulden Terrace, Richmond Road, Dalston—An improved indicator for railway carriages.

Recorded November 26.

2892. John W. Hadwen, Kebroyd Mills, Halifax, Yorkshire—Improvements in the treatment of silk waste, waste silk, or silken fibre, and in the manufacture of yarns and tissues from the same, whether alone or in admixture with other materials.
2893. William Pearson William Spurr, and Thomas Smith, Bristol, Yorkshire—Improvements in looms for weaving woollens.
2895. George F. Train, Liverpool, Lancashire—Improvements in steam carriages, and the running gear for street and other railways.—(Communication from Messrs. Grice and Long, Philadelphia, U.S.)
2896. Thomas Moy, Clifford's Inn—Improvements in direct action steam engines and pumps.
2897. William R. Shirtcliffe, Spring Lane, Sheffield, Yorkshire—Improvements in warm baths.
2898. James Birkitt, Pemberton Village, Wigan, Lancashire—Improved musical instruments, particularly applicable to piano-fortes and other such like instruments.
2899. Samuel Roberts, Hull, Yorkshire—Improvements in harrows.
2900. George Mackenzie, Paisley, Renfrewshire, and John Hamilton, Glasgow, Lanarkshire—Improvements in bobbins, or holders for textile materials.
2901. Robert Oxland, Plymouth—Improvements in the manufacture of gunpowder.
2902. Pierre Hugon, Paris—An improved mode of firing or igniting explosive gaseous compounds in motive power engines.
2903. Claud H. Jacquet, Lyons—An improved calendar clock.
2904. Isaac Sharp, and William Bulmer, Middlesborough, Yorkshire—Improvements in apparatuses for the manufacture and for the drying of bricks, tiles, and other like ware.
2905. Frederic Seiler, Paris—An improved apparatus applicable to ships' boats and other navigable vessels, for preventing the dangers of shipwreck at sea or in rivers, and for diminishing their draught of water.
2906. George Ennis, Jersey—An improved construction of oyster dredger.
2907. John S. Manton, and Thomas Islip, Birmingham, Warwickshire—Certain improved compositions useful for many purposes in connection with the arts and manufactures, and in machinery or apparatus to be employed therewith, which machinery or apparatus is also applicable to several other purposes of utility.

Recorded November 27.

2908. William S. Wood, Chislehurst, Kent—An improved arrangement of apparatus for curing smoky chimneys, and for ventilating purposes.
2909. Robert Robertson, Glasgow, Lanarkshire—Improvements in machinery or apparatus for preparing asphalte."
2910. Vincent Wanostrocht, Parkstone, Poole, Dorsetshire—An improvement in the manufacture of mineral tar.
2911. John Fowler, Waterford—Improvements in boots, shoes, gaiters, leggings, and overshoes.
2912. Joseph Smethurst, Guide Bridge, Lancashire—Improvements in slide valves of steam engines, and for other purposes where slide valves are employed.
2913. Francis S. Beatty, and Thomas Alexander, Dublin—Improvements in the production of photographic proofs, and their application to printing purposes.
2914. Thomas Pape, Nottingham,—Improvements in circular frames for manufacturing glove and other fabrics, and in apparatuses for stitching and finishing the finger ends of gloves, and for "boarding" gloves.

Recorded November 28.

2915. Jean B. L. Alliot, Paris—A machine for waxing and rubbing apartments.
2916. John Robb, Aberdeen—Improvements in gas stoves.
2917. John Sidebottom, Harewood, near Mottram, Cheshire—Improvements in reeds, and in apparatus for forming the lease or shed in machines for sizeing, dressing, warping, and weaving.
2918. Rebecca Thomas, Bath Street, Tabernacle Square—Improvements in venetian blinds for windows.
2919. David Mardell, York Terrace, York Square, Commercial Road East—Improvements in steam engines, and in obtaining feed-water for marine steam engine boilers.
2920. Henry Grafton, Chancery Lane—Improvements in the application of machinery to the cultivation of land.
2921. Henry Grafton, Chancery Lane—Improvements in apparatus or machinery for cultivating land.
2922. John Reeves, Brooklyn, New York, U.S.—Improvements in the construction of ships.
2923. Henry Gillett, Regent Street—Improvements in the ornamentation of the edges of the leaves of photographic albums, especially intended for "cartes de visite."
2924. Nathan Ager, Upper Ebury Street, Pimlico, S.W.—Improvements in apparatus for raising building materials.
2925. Thomas Holmes, Anlaby Road, Hull—Improvements in preparing and tanning hides and skins.
2926. Samuel Thomson, Motherwell, Lanarkshire—Improvements in the manufacture of iron.

2927. John Jeyes, Cheyne Walk, Chelsea—Improvements in the manufacture of boots and shoes.

Recorded November 29.

2928. Sir John T. Bethune, Rue de l'Echiquier, Paris—Improvements in the production of motive power by application of the dead weight of liquids, and in the apparatus connected therewith.
2929. Henry Gilbee, South Street, Finsbury—Improvements in welding.—(Communication from Michael Helson, Paris, France.)
2930. Herman Hirsch, Bridge Road, Lambeth, Surrey—Improvements in screw propellers.
2931. William Darley, Bishop Bridge, Market Rasen, Lincolnshire—Improvements in portable steam engines.
2932. Robert Offord, jun., Wells Street, Oxford Street—Improvements in the adaptation of India-rubber and compounds thereof to wheels.
2933. William M. Storm, New York, U.S.—Improvements in the construction of breech-loading fire-arms.
2934. James A. Jaques, and John A. Fanshaw, Tottenham, and George Jaques, Bromley—An improved mode of, and apparatus for cooling liquids.
2935. John A. Fanshawe, and James A. Jaques, Tottenham—Improvements in brushes and other scrubbing and rubbing surfaces.
2936. Thomas Cole, and David Gardner, Coventry—Improvements in looms for weaving ribbons and other fabrics.

Recorded November 30.

2938. James Fry, Wrotham, Sevenoaks, Kent—Improvements in the arrangement and construction of mills for crushing and grinding grain, seeds, oil cake, and like matters, the crushing principle being also applicable to cements, minerals, and ores.
2939. Edwin C. Perry, Sedgley, Staffordshire—Improvements in preventing accidents in or at mine shafts.
2940. George Parsons, Martock, Somerset—Improvements in the construction of wheels.
2941. Edward T. Hughes, Chancery Lane—Improvements in the manufacture of metal tubes.—(Communication from C. Kesseler, Griefswald, Prussia.)
2942. Charles Stevens, Welbeck Street, Cavendish Square—Improvements in smoke-consuming furnaces.—(Communication from Toni Fontenay, Grenoble, France.)
2943. Jacques Pelegrin, Bordeaux, Gironde, France—Inodorous basins and descent pipes of glass.
2944. Richard C. Newbery, President Street, West, Goswell Road—Improvements in the manufacture of collars and wristbands.

Recorded December 1.

2945. Robert Dawbarn, Wisbech, Cambridge—An apparatus for stopping rents or holes in fire-engine hose and other elastic tubes or pipes.—(Communication from John S. Mackay, Brooklyn, New York, U.S.)
2946. Hugh Greaves, Abingdon Street, Westminster—Improvements in the construction of railways, tramways, and in vehicles to run thereon, portions of which improvements are applicable to other useful purposes.
2947. Arthur Jackson, Liverpool, Lancashire—Improvements in generating steam as adapted to a certain arrangement or construction of steam engines for transmitting motive power.
2948. Charles Farmer and William Farmer, Birmingham, Warwickshire—New or improved machinery for the manufacture of hooks used principally as dress fastenings.
2949. William S. Losh, Wreay Syke, Cumberland—A new method of preparing sulphurous acid in solution.
2950. William L. Tizard, Mark Lane—Improvements in fastening threaded nuts and bolts.
2951. Robert Marsden, Anson Street, Park, and William Lambert, Castle Hill, Sheffield, Yorkshire—An improvement in horses shoes.
2952. James Ronald, Liverpool, Lancashire—Improvements in machinery for the spinning of hemp, flax, manilla, or wool, or other like fibrous material.
2953. James Austin, Millisle Mills, Donaghadee, Down, Ireland—Improvements in machinery or apparatus for ploughing or cultivating land, part of which machinery or apparatus may be used as a traction engine.
2954. Thomas Shedden, Ardgartan House, Argyle—Improvements in ammunition for fire-arms, and in packing the same for transport, and in the apparatus employed therein.
2955. William Clark, Chancery Lane—Improvements in looms.—(Communication from Joseph Matter, Boulevart St. Martin, Paris.)
2956. August Leonhardt, Manchester, Lancashire—Improvements in the preparation of indigo for dyeing and printing, and in obtaining "pure" or "refined" indigo.

Recorded December 3.

2957. William P. Pigott, Argyle Street, Regent Street—Improvements in the mode of generating electrical currents, manufacturing submarine telegraph cables, and the mode of transmitting signals.
2959. William Pilkington, Windle Hall, Windle, Lancashire—Improvements in furnaces for melting glass.
2960. William Galloway, and John Galloway, Manchester, Lancashire—Improvements in steam boilers.
2961. Thomas Richardson, Newcastle-upon-Tyne—Improvements in the manufacture of paper.
2962. William R. Barker, Chapel Street, Belgrave Square—Improvements in bottles for medicines and poisons.
2963. Edward T. Hughes, Chancery Lane—Improvements in treating and decomposing fatty matters, and in the machinery or apparatus employed therein—(Communication from Monsieur L. Martin, Rue St. Jacques, Paris.)
2964. John Lowden, and Robert Buckley, Royton, Lancashire—Certain improvements in carding engines.
2965. Richard A. Brooman, Fleet Street—Improvements in valves for closets and other receptacles.—(Communication from Pierre Guillaume and Frederic H. Ouin, Paris.)
2966. Joseph T. Carter, and John Austen, Sydenham, Kent—An improved method of roughening horse shoes.
2967. George Macfarlane, Draycott Street, and William E. Newton, Chancery Lane, and Richard Carte, Charing Cross, Westminster—Improvements in wind musical instruments.

Recorded December 4.

2968. Thomas Whitehead, Holbeck, Leeds, Yorkshire—Improved machinery for combining wool, hair, flax, tow, cotton, silk, and other fibrous substances.
2969. William R. Jeune, Flower Terrace, Campbell Road, Bow—Improvements in the manufacture of kamptulicon or covering for floors, and other purposes.
2971. Edwin H. Higginbotham, and Aaron Beech, Macclesfield, Cheshire—Certain improvements in machinery or apparatus for the prevention of explosions of steam boilers, arising through deficiency of water or over-pressure of steam.
2972. Benjamin Greenwood, Southfield Square, Manningham, Bradford, Yorkshire—Improvements in the manufacture of brooms and other brushes.
2973. William T. Walter, Long Acre, and Charles Henry, Bartholomew Place, Hertford Road, Kingsland—Improvements in means or processes for obtaining ornamental and other devices or effects on metal, glass, stone, and earthenware.
2974. Frank Jaques, Droylsden, near Manchester, Lancashire—Improvements in, or improved apparatus applicable to, rifled or other muskets, and to other fire-arms.
2975. Fidele Michaux, Anzin, Nord, France—A new sort of "safety lamp for mines."
2976. Robert Griffiths, Mornington Road, Hampstead Road—Improvements in screw propeller blades.
2977. George F. Stidolph, Ipswich, Thomas Simpson, and Joseph R. Morley, Woodbridge, and John Stidolph, Ipswich—Improvements in the construction of crates and other packing cases.
2978. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in the construction of clothes dryers, or folding racks for airing and drying clothes.—(Communication from John Ward, jun., Brooklyn, New York, U.S.)
2979. John B. Bayne, Chard, Somerset—Improvements in machinery for the manufacture of fishing and other nets.
2980. Charles S. Duncan, Hereford Road North, Bayswater—Improvements in the construction of electric telegraph cables or ropes.

Recorded December 5.

2981. George W. Hart, Stanley Terrace, Southsea, Hants—Improvements in the embrasures of fortifications, and in the port-holes of ships of war.
2982. Charles W. Siemens, Great George Street—Improvements in fluid meters.
2983. Charles W. Lancaster, New Bond Street—Improvements in sights for rifles and other fire-arms.
2984. George Hallett, Broadwall, Lambeth, Surrey—Improvements in coating iron and other ships' bottoms, and other surfaces.
2985. Edmund Moorwood, Enfield—Improvements in coating metals.
2986. Benjamin Gorrill, Birmingham, Warwickshire—Certain improvements in the making of gilding tools, for gilding or embossing ornaments on leather or other surfaces.
2987. George C. Lingham and Joseph Nicklin, Newhall Street, Birmingham, Warwickshire—Certain improvements in belt fastenings, and which said improvements are also applicable as a connector for brace fronts, garters, and other articles of dress.

Recorded December 6.

2989. Henry Jordan, Liverpool, Lancashire—Improvements in the construction of ships or other vessels.
2990. Joseph F. Pratt, Oxford Street—Improvements in instruments for receiving and transmitting sound, particularly adapted to the relief of deafness.
2991. Richard A. Glass, Greenwich, Kent—A method of and apparatus for preserving electric telegraph cables and wires prior to their being laid.
2992. Martin Deavin, Rotherhithe, Surrey—An improved apparatus applicable as a fire escape, also to the raising or lowering of weights.
2993. Thomas Mellodew, Oldham, Charles W. Kesselmeyer, Manchester, and John M. Worrall, Salford—Improvements in the treatment of velvets, velveteens, and other fabrics on which there are floated weft threads to be cut.
2994. Joseph Bellamy, Wednesfield, near Wolverhampton, Staffordshire—Improvements in traps for taking rats, birds, rabbits, and other animals.

Recorded December 7.

2995. Jonathan Musgrave, Bolton-le-Moors, Lancashire—Improvements in apparatus for regulating the discharge of water from steam pipes.
2996. John C. Haddan, Bessborough Gardens, Pimlico—Improvements in the manufacture of cannon, and of projectiles, part of which improvements is applicable to casting metal.
2997. Pierre Guerin, Cluny, France—Improvements in the hydraulic press.
2999. Frederick H. Edwards, Newcastle-upon-Tyne—Improvements in air engines.
3000. Stephen Holman, Lewisham, Kent—Improvements in machinery for communicating motion to and transmitting motion from reciprocating rods.
3001. John B. Turtle, Minories—Improvements in the means of communicating signals, applicable to naval, military, and railway purposes.
3002. William Clark, Chancery Lane—Improvements in machinery for planing or cutting wood, and in apparatus connected therewith.—(Communication from Jules Mareschal, Boulevart St. Martin, Paris.)
3003. James J. Wbeble, Reading, Berks—Improvements in the manufacture of artificial stone for building purposes.
3004. Benjamin G. George, Hatton Garden—Improvements in the mounting of tablets or show bills, and also of prints and drawings.
3005. Thomas Foyall, Princes Street, Fitzroy Square—An improved canteen or case for containing refreshments for soldiers or travellers.
3006. William Morris, and Job Radford, Oldbury, Worcester—Improvements in composition or compositions to be employed in the manufacture of fire-bricks, fire clay, lumps, blocks, retorts, and for all the purposes for which ordinary fire clay is now used, part or parts of which compositions may also be employed as a substitute for emery.

Recorded December 8.

3007. Joseph H. Cary, Norwich—An improvement in hammer rails.
3008. George Davies, Serle Street, Lincoln's Inn, and Glasgow, Lanarkshire—Certain improvements in the construction of steam boilers.—(Communication from Richard Montgomery, New York, U.S.)
3009. James Robson, jun., North Shields, Northumberland—Improvements in mineral-oil lamps.
3010. Robert Mushet, Coleford, Gloucester—An improvement or improvements in the manufacture of an alloy or alloys of titanium and iron.
3011. Thomas Robert, Holborn—Improvements in the construction of ships and floating batteries, and in rendering them capable of resisting the destructive force of shot, shell, and other missiles.
3012. Meredith Jones, Royal Mint—An improvement in apparatuses for preparing the edges of discs of metal for coin.
3013. Arthur Wheeler, Banner Cross, Sheffield, Yorkshire—Improvements in the manufacture of railway carriages, trucks, engines, and other vehicles, so far as the balancing power, springs, and buffers are concerned.
3014. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in apparatus for applying capsules to bottles.—(Communication from Jules Mathien, Paris.)
3015. Bartholomew Hocking, Limehouse—Improvements in the construction and mode of fitting and working furnaces.

3016. Louis Simon, Nottingham—Improvements in heated air engines.
3017. David Annan, Albert Terrace, Bow—Improvements in furnaces and fire bars.
3018. James Durrant, Warren Street, Fitzroy Square—Improvements in chimney pots, or apparatus for the tops of chimneys.
3019. William E. Newton, Chancery Lane—Improved machinery for making bricks.—(Communication from John Caswell, Adolphuss Sinsheimer, and Oran W. Seely, New York, U.S.)

Recorded December 10.

3020. Arthur Granger, High Holborn—Improvements in the manufacture of collars, cuffs, shirt fronts, clergymen's bands, stocks, and articles of a like nature.
3021. Adolphe J. Filliette, Rue Amelot, Paris—Improvements in presses for copying stamping, and embossing.
3022. Thomas Peake, Derby—An improved method of locking or 'skidding' the wheels of vehicles for the purpose of retarding or arresting the progress thereof.
3023. Joseph A. Barde, Paris—An improved portable apparatus for producing and purifying lighting gas.
3024. William Clark, Chancery Lane—Improvements in photographic apparatus.—(Communication from Charles G. Anthoni, Boulevart St. Martin, Paris.)
3025. James Young, and Christopher Cairns, Glasgow, Lanarkshire—Improvements in making moulds for casting.
3026. Richard A. Brooman, Fleet Street—Improvements in implements for digging and breaking up the soil.—(Communication from Donald Mann, New York, U.S.)
3027. Robert Davison, London Street—Improvements in apparatuses for drying and heating.
3028. Richard H. Hughes, Hatton Garden—Improvements in means or apparatus for supplying fresh air to mines and other places.
3029. Robert Hudson, Adwalton, near Leeds, Yorkshire—Improvements in means or apparatus for the generation of steam
3030. Robert Mushet, Coleford, Gloucester—An improvement or improvements in the manufacture of an alloy or alloys of titanium and iron.
3032. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire —Improvements in electric apparatus for striking the hours on bells.—(Communication from Francois Guichene, Paris.)

Recorded December 11.

3033. Joseph Townsend, Glasgow, Lanarkshire—Improvements in obtaining animal charcoal and other products from bones and other animal matters
3034. Adolphe J. Canu, Rue Laffitte, Paris—An improved pulverising and bruising machine.
3035. Charles Stevens, Welbeck Street, Cavendish Square—An impermeable anti-sulphuric coating for leather.—(Communication from J. Chapa, and Lacaze, Rue la Laffite, Paris.)
3036. Richard A. Ford, and William A. Paige, Poultry—An improved shirt.
3037. Anton Verwey, Croydon, Surrey—Improvements in the proportions of ingredients and mode of manufacture of a chemical compound for softening water.
3038. Joseph Townsend and James Walker, Glasgow, Lanarkshire—Improvements in treating bye products arising in the manufacture of soda and potash, for the obtainment of anticlores and other useful products.
3039. Anton Verwey, Croydon Grove, Croydon—Improvements in the proportions of ingredients and mode of manufacture of a chemical compound for softening water.
3040. George C. Wallich, Campden Hill Road, Kensington—Certain improvements in apparatus for taking deep sea soundings.
3041. Hiram Tucker, Queen's Square, Bloomsbury—Improvements in bedsteads.
3042. Thomas Massey, Birchin Lane—Improvements in sounding machines.
3043. John Pym, Lawrence Pountney Hill—Improvements in railway sleepers.
3044. James Steart, St. James' Road, Blue Anchor Road, Bermondsey, Surrey—Improvements in treating skins for the manufacture of leather.

Recorded December 12.

3045. Robert Mushet, Coleford, Gloucester—Improvements in the manufacture of cast steel.
3046. Henry Hall, Stack Steads, Lancashire—Improvements in machinery or apparatus for spinning and doubling fibrous materials.
3047. Alfred F. Jaloureau, Paris—Improvements in means or processes for holding, protecting, and insulating subterraneous telegraph wires.
3048. Henry Newey, Birmingham, Warwickshire—Improvements in the manufacture of certain parts of umbrellas and parasols.
3049. John Scott, Sunderland, Durham—Improvements in reefing and furling sails.
3050. Charles P. Moody, Corton Denham, Somerset—Improvements in the construction of gates.
3052. Samuel T. Cornish, Beaumont Square, Mile End—Improvements in the construction of ships for the purpose of rendering them shot and shell proof.
3053. George Richardson, Mecklenburg Square, and Edwine D. Chattaway, Bromley—Improvements in apparatus for enabling guards and engine drivers of railway trains to communicate with one another.
3054. Alexander Kyle, Binghill, Aberdeen—Improvements in machinery or apparatus for propelling ships or vessels and boats.
3055. Samuel C. Lister, and James Warburton, Manningham, Yorkshire—Improvements in spinning and doubling.
3056. Robert Pitt, Newark Foundry, Bath, Somerset, and Stephen F. Cox, Bristol—Improvements in apparatus employed in the manufacture of leather.

Recorded December 13.

3057. John Casson, Wellington Street, Woolwich—An improved machine for dressing dried fruits, and separating and removing therefrom the stems and other refuse without injury to the fruit.
3058. John G. Reynolds, Wharf Road, City Road—Improvements in coating or covering the surfaces of smoking pipes and other articles, fictile, metallic, or otherwise, to obtain ornamental and useful effects.
3059. Robert Henson, Strand—Improvements in eye glass and spectacle frames.
3060. George F. Chantrell, Liverpool, Lancashire—An improved draught generator.—(Communication from Isadore Alleweireldt, Bruges, Belgium.)
3061. Charles Neville, Great Dover Road, Surrey—An improved washing apparatus.
3062. Thomas West, Warwick—An improved apparatus for slicing, shredding, and pulping turnips and other roots.
3063. Samuel Pitts, Catherine Street, Strand—Improvements in billiard tables.
3064. William Clark, Chancery Lane—Improvements in the manufacture of gas.—(Communication from Heber Marina, Paris, France.)
3065. General O. Vandenburgh, New York, U.S.—Improvements in breech-pieces of breech-loading cannon.
3066. Frederick John Evans, Gas Works, Horseferry Road, Westminster, and George F. Evans, Gas Works, Brentford—Improvements in the manufacture of illuminating gas.
3067. Joseph R. Cooper, Birmingham, Warwickshire—An improvement or improvements in breech-loading fire-arms.
3068. Emanuel Jones, Manchester, Lancashire—An improvement in rifling small arms and ordnance.
3069. Charles Reeves, Birmingham, Warwickshire—Improvements in breech-loading fire-arms.
3070. Robert Mushat, Coleford, Gloucester—Improvements in the manufacture of iron and steel.
3071. John Chubb, St. Paul's Churchyard, and Ebenezer Hunter, Wolverhampton—Improvements in locks.
3072. William D. Allen, Laithfield House, Norfolk Road, Sheffield, Yorkshire—Improvements in the manufacture of the bearings or "brasses," in which the axles of locomotive engines and carriages revolve, and also in the bearings, "brasses," and other parts of plumber blocks employed in machinery generally.
3073. John A. Mello, Welbeck Street, Cavendish Square—Improvements in the manufacture of stereoscopic slides.

Recorded December 14.

3074. James Fenton, Queen Street, Lincoln's Inn—An improved method of securing the wearing tyres on wheels.
3075. John Jackson, West Grove, St. John's Hill, Battersea, Surrey—Improvements in lamps.
3076. John P. Baragwanath, Castle Street, Falcon Square—Improvements in hydraulic punching apparatus.—(Communication from Richard Dudgeon, Columbia Street New York, U.S.)
3077. William Clark, Chancery Lane—Improvements in signalling from one part of a railway train to another.—(Communication from Andre L. H. de Goy, Boulevard St. Martin, Paris, France.)
3078. William E. Newton, Chancery Lane—Improved pavement for streets.—(Communication from Lucius Stebbins, New York, U.S.)
3079. William E. Newton, Chancery Lane—Improved machinery for cutting and rounding corks and bungs.—(Communication from Alexander Millar, New York, U.S.)
3081. Henry Batchelor, Newport, Monmouthshire—Improvements in the construction and manufacture of models of ships, boats, or other vessels.

Recorded December 15.

3083. Nathaniel C. Barton—An improved scaling ladder for military, naval, and other purposes.
3084. George Davies, Serle Street, Lincoln's Inn, and St. Enoch Square, Glasgow, Lanarkshire—Improvements in building bridges, ships, or other structures of iron or other metal.—(Communication from Richard Montgomery, New York, U.S.)
3085. George Davies, Serle Street, Lincoln's Inn, and St. Enoch Square, Glasgow, Lanarkshire—Certain improvements in rolling and corrugating plates of metal, and in machinery or apparatus employed for such purposes.—(Communication from Richard Montgomery, New York, U.S.)
3086. George Davies, Serle Street, Lincoln's Inn, and St. Enoch Square, Glasgow, Lanarkshire—Improvements in the construction of iron or other metal beams, and in machinery and apparatus employed for such purpose.—(Communication from Richard Montgomery, New York, U.S.)
3087. John G. Williams, Blaenavon, Monmouth—Improvements in extracting inflammable and other noxious gases from coal and other mines.
3088. Arthur Kinder, Great George Street, Westminster—Improvements in machinery or apparatus for cutting wood.
3089. Alexander Prince, Trafalgar Square, Charing Cross—Improvements in steam engines.—(Communication from Francois J. de Bayelt, Lyons, France.)

Recorded December 17.

3092. Nicholas C. Szerelmey, Park Terrace, Brixton Road, Surrey—An improved method of, and apparatus for, purifying oils and varnishes.
3094. James Morison, Paisley, Renfrewshire—Improvements in apparatus for spinning or twisting.
3095. Rudolph Bodmer, Thavies Inn, Holborn—Improvements in machinery or apparatus for preventing or modifying the effects of collisions on railways.—(Communication from Giovanni Pagliari, Rome.)
3097. Abraham Denny, and Edward M. Denny, Waterford, Ireland—Improvements in apparatus for singeing the carcasses of dead pigs.
3098. Alfred Eddington, Springfield, Chelmsford, Essex—Improvements in draining ploughs.
3101. Thomas W. Walker, Poole, Dorsetshire—Improvements in the manufacture of ornamental bricks, tiles, and other articles of a similar nature, and in the machinery or apparatus employed therein.

Recorded December 18.

3102. Erenest L. Morel, Paris—Improvements in ship rudders, and the mode of mounting or applying the same to the stern posts of vessels.
3103. Ferdinand Silas, Leicester Place, Leicester Square—An aerostatic signal apparatus, to be called 'semasphere.'
3105. Charles Stevens, Welbeck Street, Cavendish Square—An improved cooking stove. —(Communication from Zimmermann, Rue Laffitte, Paris.)
3106. Thomas L. Preston, and Thomas Lloyd, Birmingham, Warwickshire—Improvements in the manufacture of metallic bedsteads, chairs, and couches, and other articles of like manufacture.
3107. Richard W. M'Arthur, Chapel Street, Belgrave Square—Hulling and dressing rice and other grain.—(Communication from Thomas Sutherland, Melbourne, Victoria.)
3109. Richard A. Brooman, Fleet Street—Improvements in spears for cutting sheet metal and other materials.—(Communication from Jean Momet, Paris.)
3110. Charles L. Hancock, Pentonville—An improved fuel.
3111. John Paterson, Wood Street—An improved neck tie.
3112. James Chesterman, Sheffield, Yorkshire—Improvements in door and gate springs, hinges, and centres, the improved springs being applicable to other purposes for which springs are employed.

Recorded December 19.

3114. William Spence, Chancery Lane—Improvements in apparatus for closing doors and keeping them closed.—(Communication from Robert B. Donaldson, Washington, Columbia, U. S.)
3115. James M'Gauley, Pimlico—Improvements in means or apparatus for preventing collisions on railways.
3116. Richard J. Cole, and Mary Scarvell, Pembridge Gardens, Bayswater—Improvements in ornamenting or illuminating glass for decorative purposes.

3117. Obed Blake, Southampton Street, Strand—Improvements in the manufacture of that description of glass termed plate glass.
3118. John Brinkley, Carrickfergus, Antrim—Improvements in furnaces for consuming or preventing the emission of smoke.
3119. Michael Henry, Fleet Street—Improvements in the manufacture of colours applicable for various uses in arts and manufactures.—(Communication from Benoit M. A. Glenard, Boulevart Saint Martin, Paris.)
3120. Richard A. Brooman, Fleet Street—An improvement in irons for ironing.—(Communication from Joachim E. D. Fossard, Paris.)
3121. Richard A. Brooman, Fleet Street—Improvements in the treatment of caoutchouc, and the employment of a product obtained thereby, for lubricating and coating bodies.—(Communication from J. D. Duhoussett, and P. E. Thomas, Paris.)
3122. John Gilmour, Ramsgate, Kent—An improved method of raising water in baths.
3123. Charles W. Robinson, and Joseph Robinson, jun., Limerick, Ireland—The singeing of the hairs off pigs after being killed, without letting the flames or smoke from the fires come in direct contact with the pig.

Recorded December 20.

3124. William Mossman, Cleveland Terrace, Downham Road, St. Mary's, Islington—The manufacture of bonnets from papered cloth.
3126. John West, Kingstown, near Dublin—Improvements in apparatus for drying grain —(Communication from John J. West, Mendota, Illinois, U.S.)
3127. James Clark, younger, Longford Street, Rochdale—Improvements in warping.
3129. George Hadfield, Carlisle, Cumberland—Improvements in the preparation of wood for conversion into casks or barrels, and in machinery to be used for that purpose.
3130. Frederick Schwann, Gresham Street—Improvements in dressing and stiffening fabrics and yarns, and in preparing the cementing and stiffening materials used.
3131. Francis B. Baker, Sherwood Street, Nottingham—Improvements in the manufacture of lace.
3132. George B. Rennie, Holland Street, Blackfriars—Improvements in machinery, apparatus and works of construction, intended to be employed, and the mode or method of using or employing the same for the purpose of examining or repairing ships and other vessels.
3133. Edward Whitehall, Nottingham—Improvements in machinery for embroidering on lace and other fabrics.
3134. Edward Southam, Manchester—Improvements in machinery and apparatus for retarding and stopping railway trains.

Recorded December 21.

3135. William Price, Wood Street, Lambeth, Surrey—Improvements in the manufacture of articles called shives, tits, bungs, and corks, or other conical bodies, whether made out of wood, cork, or any other substance.
3137. Henry Loveridge, Wolverhampton—Improvements in meat screens.
3138. John Chatterton, Highbury Terrace, and Willoughby Smith, Pownall Road, Dalston —Improvements in the manufacture of electric telegraph cables.
3139. Thomas Moore, Regent Circus, Piccadilly—Improvements in navigating ships.
3140. John Rigby, Suffolk Street, Dublin, and Joseph Needham, Piccadilly—Improvements in breech-loading fire-arms and cartridges.
3141. Thomas Hunt, Crewe, Cheshire—Improvements in apparatus for supplying steam generators with water.
3142. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire —Improvements in magneto electric machines.—(Communication from Hypolite Worms, Paris.)
3143. James Glover, Dane's Inn, Strand — Improvements in mounting and affixing opaque letters or numerals on a translucent ground.

Recorded December 22.

3144. Charles Peters, Coventry—Improvements in looms used in the manufacture of ribbons and other fabrics.
3145. James Johnstone, Pond Street, Hampstead—Improvements in apparatus for withdrawing corks from bottles.
3146. Edward Cook, and James Stokes, Birmingham, Warwickshire—Improvements in sacking and joints for bedsteads.
3147. Henry Hughes, Loughborough, Leicester—An improved method of making wheels for carts, waggons, and carriages for common roads and railways.
3148. George Sandys, Aldersgate Street—A novel instrument or apparatus for conveying signals or communicating intelligence between railway stations and other distant points.
3149. Thomas B. Marshall, Queen Street, Cheapside—Improvements in wind musical instruments.
3150. William Clark, Chancery Lane—Improvements in the manufacture of colouring matters.—(Communication from Charles E. Kopp, Boulevart St. Martin, Paris.)
3152. Alfred V. Newton, Chancery Lane—Improvements in watches.—(Communication from A. L. Dennison, Waltham, Massachusetts, U.S.)

Recorded December 24.

3153. William J. Gibbons, Birmingham, Warwickshire—Improvements in steroscopes and their cases.
3155. Charles H. Adames, Birmingham, Warwickshire, and Cornelius Whitehouse, Wolverhampton, Staffordshire—A new or improved mode of manufacturing frying-pans, and other articles produced from sheet iron or other metals.
3156. William E. Newton, Chancery Lane—An improved archers' bow and bow gun toy. —(Communication from William H. Stevens, and Benjamin R. Norton, New York, U.S.)
3157. John A. Fanshawe, and James A. Jaques, Tottenham—Improvements in the manufacture of fabrics with rubbing or friction surfaces.
3158. James L. Norton, Belle Sauvage Yard, Ludgate Hill—Improvements in apparatus for drying wool and other fibres.
3159. James L. Norton, Belle Sauvage Yard, Ludgate Hill—Improvements in apparatus for drying wheat, barley, and other grain and seeds.

Recorded December 26.

3161. Francis Puls, Hackney, Wick—Improvements in obtaining products from coal, gas tar, gas pitch, coal tar, asphalte, resin, and other bituminous and resinous substances.
3162. Charles Lizars, Rue Lafayette, Paris—Improvements in gas meters.
3163. Spendlove Desborough, Noble Street, and Samuel Middleton, Essex Street, Strand —Improvements in the manufacture of boots and shoes, and in the means and apparatus employed for uniting and preparing surfaces of leather and similar materials for this and other purpose.
3164. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire —Improvements in instruments for assisting the sense of hearing.—(Communication from Charles G. Page, Washington, Columbia, U.S.)
3165. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire —Improvements in smoothing irons.—(Communication from Antoine J. A. C. de Mocomble, Paris.)
3166. William Darby, Birmingham, Warwickshire—Improvements in constructing and working stamps for cutting and shaping metals.

Recorded December 27.

3167. Frederick Sage, Hatton Garden, St. Andrew's—Improvements in brackets for carrying trays, shelves, glass cases, &c., in windows and glass cases.
3168. William Parry, High Street, Deptford, Kent—Improvements in the manufacture of chimney pots, pedestals, and such like articles made from clay or plastic materials, and machinery for that purpose.
3169. John T. G. Stone, Gopsall Street, Hoxton — An improved method of covering steel used for ladies' crinolines, and other articles of dress.
3170. Richard A. Brooman, Fleet Street—Improvements in axle boxes and in naves of wheels.—(Communication from Pierre J. Bertrand, St. Paul les Dax, France.)
3171. Toussaint V. Gucrree, L'Aigle, France—An apparatus for moving waggons or carriages on railways.
3172. William Hill, Milton Street, and Henry Barber, Sheffield, Yorkshire—An improvement in the manufacture of spring knife scales and knife handles.
3173. Robert Parnall, and Henry Parnall, Bishopsgate Street Without—Improvements in means for promoting warmth and comfort in railway and other travelling.
3174. William R. Mulley, Lockyer Street, Plymouth—Improvements in apparatus for steering ships or vessels.
3175. George Dodman, and William Bellhouse, Rochdale, Lancashire—Improvements in thoists.

Recorded December 28.

3176. Alfred V. Newton, Chancery Lane—An improvement in the construction of bedsteads.—(Communication from Tyler Howe, Cambridge Port, Massachusetts, U.S.)
3177. George H. Birkbeck, Southampton Buildings, Chancery Lane—Improvements in furnaces for consuming smoke.—(Communication from Francois J. Chery, Paris.)
3179. Christopher Binks, Parliament Street—Improvements in manufacturing certain gases applicable in generating heat and light, and in bleaching.
3180. Iro Dimock, Florence, Hampshire, Massachusetts, U S.—Improvements in machinery for cleaning, sorting according to size, and doubling silk and other thread.—(Communication from Goodrich Holland, Windham, Connecticut, U.S.)
3181. Claude Pallu, Nogent-sur-Marne, near Paris—Improvements in the apparatuses and process for producing photographic pictures without working in dark rooms.
3183. Alfred V. Newton, Chancery Lane—An improvement in breech-loading fire-arms.—(Communication from Mahlon J. Gallagher, Philadelphia, U.S.)
3184. John S. Russell, Great George Street—Improvements in constructing and arming ships and vessels, and also floating and land batteries.
3186. William Clark, Chancery Lane—An improved tissue, fabric, or structure.—(Communication from Michel A. Graziani. Boulevart St. Martin, Paris.)

Recorded December 29.

3187. Egbert R. Burnham, Liverpool, Lancashire—Improvements in apparatus or machinery for stamping, shaping, or forming certain kinds of goods, manufactured of India-rubber, gutta percha, and like substances.
3189. Henry W. Viner, Penzance, Cornwall—Improvements in grand pianofortes.
3191. George Davies, Serle Street, Lincoln's Inn, and Glasgow,—Improvements in printing calicoes and other fabrics.—(Communication from Gabriel Descat, Paris.)

Recorded December 31.

3193. Benjamin N. de Buffon, Rue des Saints Pères, Paris—Improvements in apparatuses for clarifying and purifying water and other liquids.
3194. John Midgley, John Sugden, and William Clapham, Keighley, Yorkshire—Improvements in trombones.
3195. William Eades, Birmingham, Warwickshire—An improved screw-wrench.
3196. William Clissold, Dudbridge, Gloucester—An improved construction of clutch for driving gear.

Recorded January 1, 1861.

1. Edward Tomlinson, Manchester, Lancashire—An improved apparatus for facilitating the placing of cop tubes on the spindles of spinning and doubling machines.
2. George Cook, Croydon, Surrey—An improved watch movement.
3. Michael Henry, Fleet Street—Improvements in breaks applicable to carriages and rolling stock, used on railways and elsewhere.—(Communication from Phillipe L. A. Stilmant and Louis A. F. Allain, Boulevard St. Martin, Paris.)

Recorded January 5.

28. Pierre Courtais, and Fortune Jammet, Port Vendres, Pyrenees Orientales, France—Manufacturing of paper and pasteboard waterman.

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 14th December, 1860, to 11th January, 1861.

Dec.	14,	4316	Henry Cutler, 6 Conduit Street, W.—"Drawers or pantaloons."
"	15,	4317	Samuel Ellis, 22 Summer Street, North, Dublin—"Ellis's cramp preventer and invalid's fender."
"	18,	4318	W. Blenkiron and Son, 123 Wood Street, Cheapside, E.C.—"Slide buckles for braces."
"	20,	4319	R. W. Winfield and Son, Birmingham—"Fire guard."
"	20,	4320	James Mellor, 7 Chestergate, Macclesfield—"A design for both scarf and tie (the Garibaldi)."
"	22,	4321	Walter Jessop, 4 Royal Crescent, Cheltenham—"The pillow cap for travellers."
"	29,	4322	William H. Blanch, 29 Gracechurch Street, E.C.—"An indestructible snap cap."
Jan.	4,	4323	Robert Bryant, 13 Gt. Queen Street, Lincoln's Inn, W.C.—"A portable gun and cartridge case for a breech-loading gun."
"	8,	4324	Sharp, Perrin and Co., 40 Old Change, E.C. — "The registered ladies' drawers."
"	10,	4325	Frederick Cox, Brick-kiln Street, Wolverhampton—"Canteen."
"	11,	4326	Welch, Margetson, and Co., 16 and 17, Cheapside, E.C.—"False shirt front."

THE PRESSURE, EXPANSION, AND SUPERHEATING OF STEAM.

III.

In proceeding to examine the important questions of high pressure, expansion, and superheating of steam, I freely admit that there may be some points which are attended with difficulty. Because the opinions of engineers on these questions are much divided, and the number of patents which have been taken out for improvements, on one or other of those principles, have, I think, had a tendency to retard a free inquiry; many of the patentees straining facts, in order to make good their claims to a great saving of fuel, and thus, for a time, misleading.

In this examination I have no particular theory to maintain, except what may be clearly indicated in course of the various experiments. In the metals and fluids experimented upon, three facts have been distinctly indicated, that is, contraction, expansion, and a mean point. That we may have a clear perception of expansion, let us carefully examine the expansion of mercury, water, and steam, and this may assist us in judging of the probable extent to which expansion may be maintained with economy. It will be necessary that we first examine carefully the expansion of water. First, the increase which we observe in its volume when heat is applied, and its contraction when the temperature is lowered. Secondly, the particles which compose the liquid are strongly attracted to each other, as may be observed from their collecting together and forming spherical drops—this attraction is much stronger in mercury than water; an increase of heat diminishes this attraction, so that each fluid has an expansion peculiar to itself. Thirdly, water is a bad conductor of *heat* and *electricity*, also, that there is a point of maximum density, and that when heated above, or cooled below that point, the water expands. This fact was first observed by the Florentine Academicians. They filled a glass ball with water, the ball having a graduated neck or stem by which the expansion or contraction of the water could be observed. A mixture of snow and salt was procured, and the ball surrounded by it; the water suddenly started up in the stem, and then gradually contracted for a little, it then began to rise slowly, then a portion of it formed ice, when its volume immediately expanded, thus clearly showing expansion, contraction, and a maximum point. This experiment, in the course of time, was repeated in different countries. In this country, at the Royal Society, by Dr. Croune. *

De Luc seems to have been the first who endeavoured to find at what degree of temperature the expansion proceeded from cold, this he fixed at 41°. Sir E. Blagden, and Mr. Gilpin repeated the experiment, and made corrections for the expansion of the glass, and thus fixed the degree of maximum density at 39°, and the expansion nearly the same above and below. Dr. Dalton published similar experiments and tables in 1802.

That the expansion of water may be very clearly indicated is shown by plate, 26, fig. 1 of which represents the expansion of water in proportion to the heat applied; this figure giving a much clearer perception than a combination of tables would. Each division was marked at the instant the mercurial thermometer indicated the different points, as 40°, 50°, &c., up to 210°, thus indicating the expansion of the water when ascending. The divisions on the left hand side indicate the corresponding points when the water is cooling, thus clearly showing that the law of contraction is different from that of expansion. To find the difference of heat between the water in the glass ball of the water thermometer, referred to in the first article, and that in the boiler in which it was immersed, a small thermometer was passed down its stem, which indicated that the temperature of the water in the ball was 10° lower than that by which it was surrounded, this difference gradually decreased as it approximated the boiling point. The reverse of this took place when the water was cooling, that is, the water within the glass thermometer retained the heat longer than that by which it was surrounded. I also procured a brass ball, similar in size to the glass one referred to, having a glass stem inserted into it; when this was filled with water and immersed in a similar way to that followed in the case of the glass thermometer, the action of the water was much more violent than in the glass, and the difference of heat was also less. The brass being a conductor of electricity and the glass a non-conductor, may not electricity be the cause of the difference? Or may not the latent heat of the water for a time repel the sensitive heat applied. Does not magnetism furnish us with an analogy? Let us suppose two magnetic bars, the one having a magnetic power equal to 140, the other a power equal to 1000; now from experiment we know that the similar poles of the bars would for a time repel each other, and this would continue until the pole of the weaker became reversed.

EXPANSION OF VAPOUR OR STEAM.

Fig. 2 represents the degrees of heat of the thermometer on the right hand side, marked as 40°, 50°, &c. The divisions on the left hand side represent the force of vapour in pounds corresponding to the degree of heat in vacuum; from these divisions the force of vapour can at any time be observed. This may be found useful when applied to the condenser, or to fluids boiled in vacuum; the heat at $58°·5 = \frac{1}{4}$ lb., $80° = \frac{1}{2}$ lb., $93° = \frac{3}{4}$ lb., $102° = 1$ lb., $212° = 15$ lbs. This table conveys a clear perception of the pressure and expansion of vapour. This scale is deduced from the experiments of Regnault, and every confidence may be placed in its correctness.

Fig. 3 is a continuation of the same scale, *i.e.*, degrees of heat and pounds of pressure, beginning at 212°, and ending at 380°, as follows:—$228° = 5$ lbs., $240° = 10$ lbs., $250° = 15$ lbs., above the atmosphere.

In comparing the expansion of pressure in vapour or steam with the divisions of degrees, as indicated when the expansion of the water begins, as 70°, 80°, &c., it will be observed that there appears to be a relation between the beginning of expansion and the extreme points of pressure. In the expansion of contraction or cooling, the pressure is less than in that of ascending or increasing, thus following a similar law to that of water. The extreme points of pressure cannot be relied upon, as they have been constructed from formulas which do not agree with experiments.

Fig. 7.

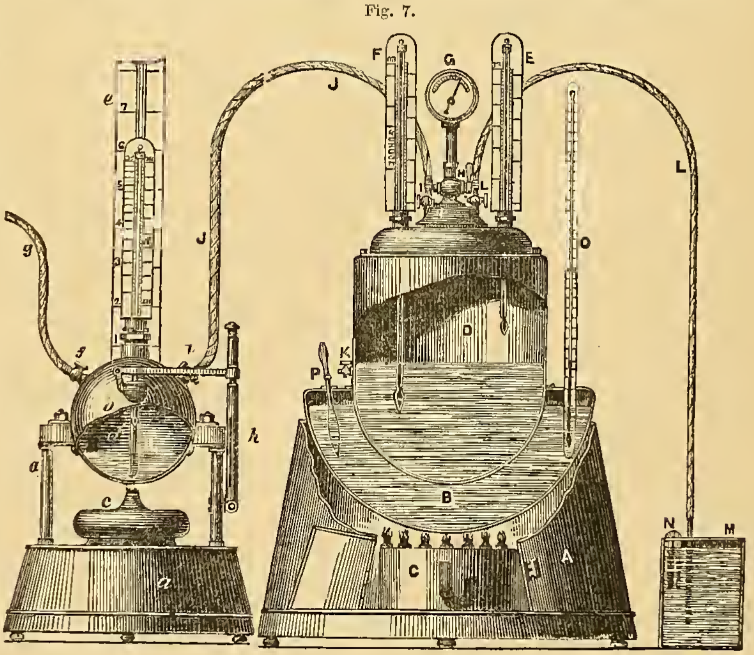


Fig. 4 represents the expansion of mercury as indicated by the pyrometer, from the mercurial bar, referred to in chapter 1. From the indications on this scale, it is evident that the same laws are indi-

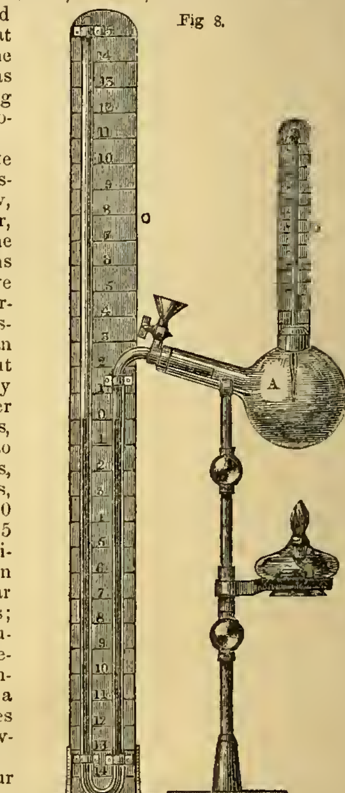
* See letter in reply to that of Mr. Williams, page 321.

cated, but different in degree. From these scales we perceive at once that the rate of expansion in the volume of the liquid mass depends on its temperature, and that the increase of temperature of mercury and of water is accompanied by the expansion of these fluids. They will also assist us in forming some idea of expansion in other bodies. A very complete table of the expansion of water from the freezing point to 212°, was formed by Despretz.*

The accompanying engraving, fig. 7, represents the apparatus used in experimenting on the pressure, expansion, or contraction of steam. A, is the frame which supports a small spherical cast-iron boiler, B; and C, the spirit lamp for heating. A thermometer gauge, D, is made to pass through a stuffing box in the top of the boiler; its use is to indicate the heat of the steam. E, represents a barometer gauge tube and scale; the tube passes through a stuffing box, and it serves to indicate the pressure of the steam. The lower end of the tube was slightly bent and made to rest on the bottom of the boiler, which contained a quantity of mercury, and as the pressure of steam increased in the boiler, the mercury rose in the tube, and indicated the pressure. H, is the safety valve; J, the tube used for opening a communication with the large boiler; G, the cock and tube for blowing off; this may be called the superheating boiler. The first experiment with this boiler was to find how far the thermometer degrees of heat agreed with the pounds of pressure indicated by the barometer gauge. The thermometer scale was likewise graduated to indicate pounds of pressure corresponding to degrees of heat. A quantity of water was put into the small boiler and a lamp applied. The two gauges kept pretty close as far as twenty pounds; then, a gradual difference began to be indicated, which was somewhat considerable, at forty pounds; at this point of pressure the lamps were removed, and the barometer and thermometer gauges were closely observed for the heat and pressure, my object being to find if the heat and falling pressure coincided with the degrees of heat and pressure indicated when rising. The falling pressure did not agree with those of rising; there was a difference similar to that indicated in the water, but in a less degree. When making these observations, I observed that when the lamps were removed, the first effect was a slight increase of pressure, then an immediate fall, equal to $\frac{3}{4}$ of a pound, then a rebound upwards and a gradual fall. I repeated this experiment at twenty-five pounds, and observed similar results, but in a less degree and the fall not quite so rapid. I will offer no opinion at present on the above indications, as I intend to verify these experiments at much higher temperatures. Experiments were also made on the steam from the large boiler with similar results, in this case the heat applied to the large boiler was by a gas organ having five burners, so that the heat could be tempered to any fixed degree of pressure. The heat in the large boiler was raised to 212°, and the heat of the superheating boiler to 300°; the pressure indicated by the gauge in the superheating boiler was equal to one pound, this being the amount gained from superheating. The pressure was then raised to five pounds in the large boiler, the superheating gauge indicated fully $5\frac{1}{2}$ pounds. The pressure in the large boiler was after this raised to 10 pounds, the gauge of the superheating indicated nearly $10\frac{1}{2}$ pounds. The pressure was then raised to 15 pounds, and the superheating boiler raised to 350°, and each gauge indicated $15\frac{1}{4}$ pounds. The pressure in the large boiler was thereafter raised to 20, 30, and 40 pounds. At these points of pressure the gauges on both boilers indicated nearly alike. At this point of pressure the superheating boiler was made to indicate 500° of heat, when the barometer gauge indicated a tendency to fall. The steam connection with the large boiler was closed by the cock, I, the mercury in the barometer tube indicating 45 pounds, began to fall slowly, and continued to do so until it disappeared, thus clearly indicating that the pressure or dynamical energy was entirely destroyed. This experiment I repeated many times, and invariably found similar results. If this experiment is made by any party, care must be taken to have the mercury thoroughly dried before closing the stop-cocks, F and I. In my first experiments I closed them too hurriedly, and narrowly escaped an accident.

When the superheating boiler was raised to 500°, there would be a certain amount of vapour from the mercury which might so far affect the correctness of the experiment, and in order to verify it, I procured a glass globe, A, fig 8, four inches in diameter, having a neck, six inches in length, and one inch in diameter. Into this neck was inserted a brass tube, properly stuffed; a filler and stop-cock, with tube attached, was passed through the stuffing, the use of this being to supply water to the globe; there was also passed through the stuffing the point of a glass mercurial gauge, C. In the top of the globe there was a small tubulure or neck into which was fitted a thermometer, B, by which the temperature could be observed at any time during the experiment. A small quantity of water was passed into the globe, and a spirit lamp applied. The water in a short time began to boil and the steam or vapour was allowed to escape, until the last globule assumed the vapour form. At this instant the stop-cock was closed and the expansion noted. So far as indicated to 212°, it was similar to that given by Regnault and others (that is, fully one-third), but when the heat was raised to between 400° and 500° (fully two-thirds), its dynamical energy seemed to decrease. It would appear from these results, and from what we know of the expansion of metals and fluids, that there is a mean point where expansion begins to decrease and continues to do so until the vapour becomes decomposed, or its dynamical energy suspended. It seems clear that the expansion indicated at 212°, being over one-third, does not follow in the same ratio, as is generally inferred. There is an opinion held by many that the higher the superheating is carried, the greater is the power gained; but it appears that when carried beyond certain points it is attended with a loss instead of a gain. From experiments made on air, it appeared to stand a much higher temperature than steam, but certainly it did not double its volume at 600°. These experiments I will verify hereafter. The annexed engraving, fig. 9, represents the form of the instrument used in this experiment. The main tube, A, 6 inches long, was attached to a scale, B; the bends, C and D, were equal to $1\frac{1}{2}$ inches in length. The bends, A and C, were filled with mercury, D, being filled with air; and the expansion of the air by heat was indicated in the tube, A. The fluid used for heating the air was linseed oil, its temperature being indicated by a mercurial thermometer.

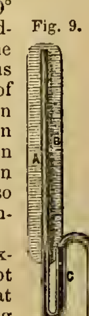
Fig 8.



In a work, published by the late Dr. Thomson, Professor of Chemistry in the University of Glasgow, when treating of heat and vapour, he says:—"It is obvious that the elasticity of steam by no means increases at such a rate as we have supposed from the tables." Referring to the tables of extreme pressures, he says,—"I think there can be no doubt that somewhere about 350°, the increase of elasticity begins to follow a much smaller rate." According to Mr. Perkins, the elasticity at 419° is equal to 1050 inches of mercury; whereas, by the tables it is 1920 inches, thus showing a difference of 870 inches, or a pressure equal to 435 pounds. From this it seems evident that the pressure or expansion of steam or vapour follows a similar law to that of the metals and fluids; that there is a mean point of expansion, beyond which a gradual decrease follows as the heat is increased, and when carried past a given point the dynamical energies become suspended, the vapour having undergone a physical change.

The expansion of steam or vapour may be reasoned on similar principles to those of air or gases, as it is generally found that all gases indicate the same expansion of volume when submitted to a similar increase of temperature; the expansion of air, heated from 32° to 212°, is fully one third of its volume, then, if we multiply 180° by 3 (180° being the difference between 32° and 212°), according to this we find the degree of heat at which its volume would become two. From this it would appear that gaseous vapours would become double their bulk, at a temperature of 540°. This, we think, may be safely doubted. There can be no doubt but that the superheating of steam to a certain extent may be attended with advantage, for the steam in passing to the point of executive power, must lose a certain amount of its heat, hence the necessity for superheating, so that its density may be maintained as near as possible without heating it to an extreme point.

Fig. 9.



It may be said that we gain considerably by the heat expanding it, but what would be gained in that way would not be worth the expense incurred. Let us suppose the heat of the steam to be 260°, or 20 pounds pressure—keeping in view that we have the expansion equivalent to that degree of heat—the expansion to be gained by superheating the steam 30° or 40° higher would not exceed one-eighth of a pound, so that the object of superheating is to maintain the heat of the steam as near as possible to its density at the point of executive power. From the steam chart accompanying the last article, it will be observed that when the pressure is carried considerably higher than those points referred to, the proportion of fuel required to maintain the pressure is considerably

* See article "Expansion," in the late Professor Nichol's Encyclopedia.

APPARATUS FOR SUPPLYING LO

J. RAMSBOTTOM, ESQ^{R} OF T

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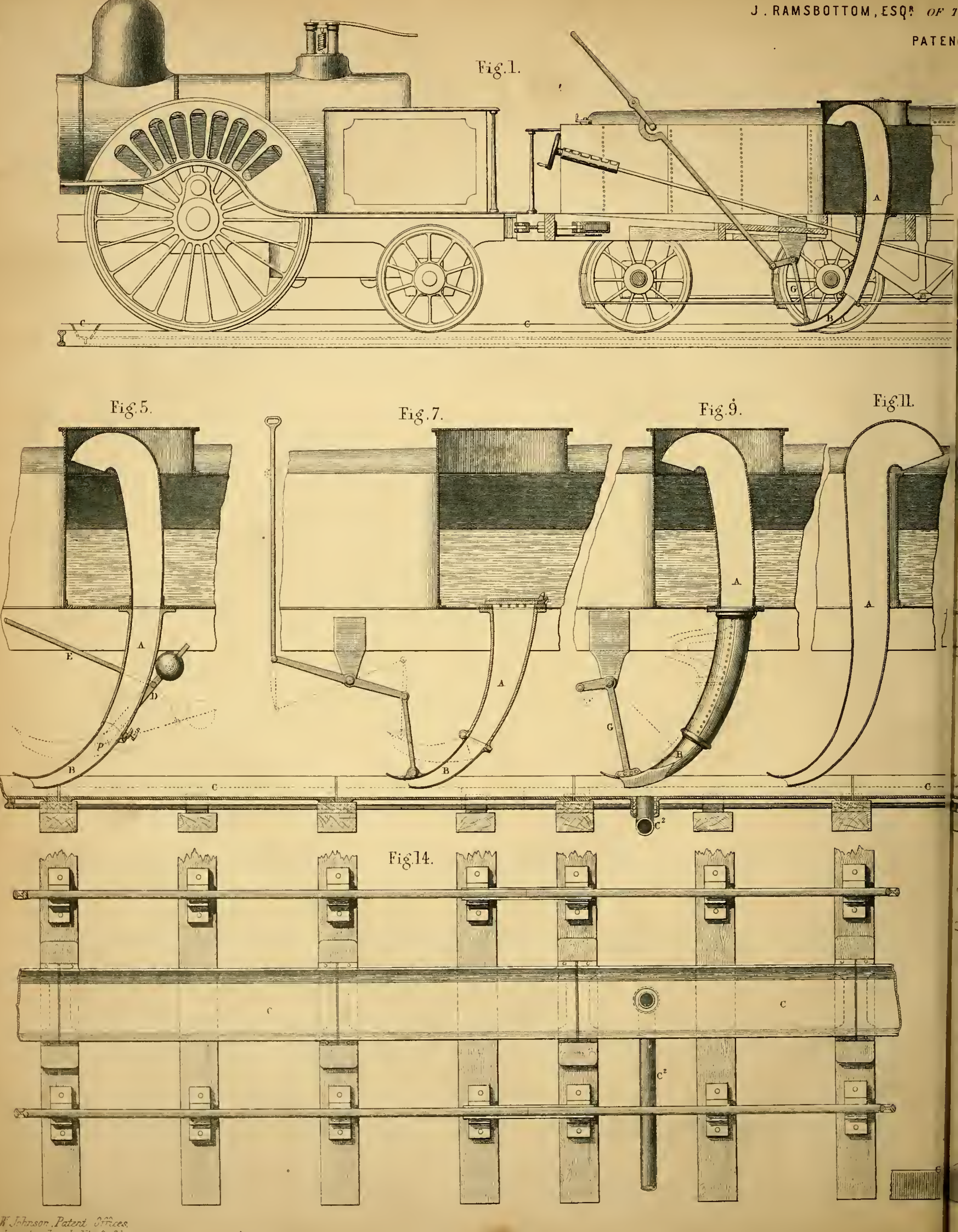
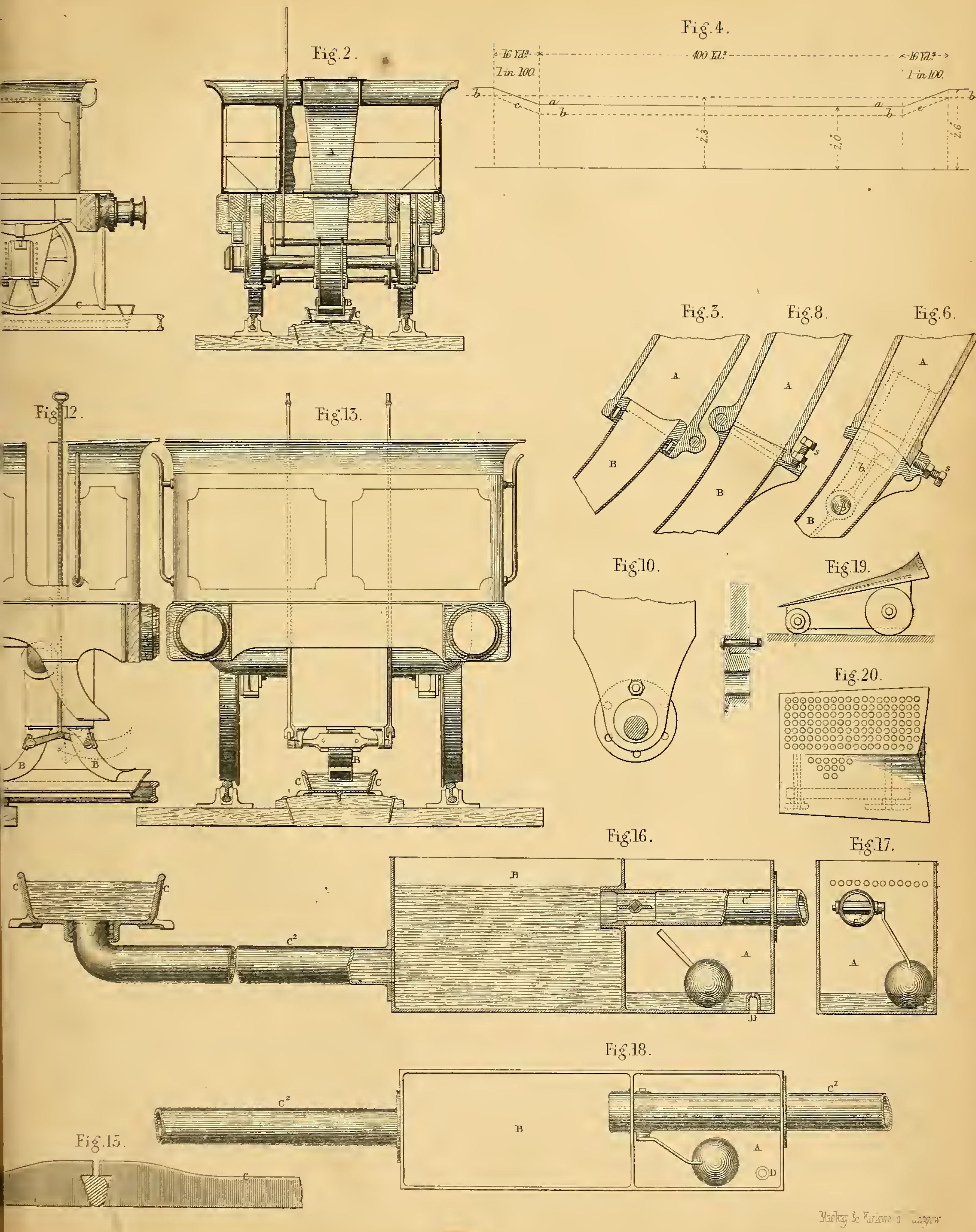


W. Johnson, Patent Offices,
47 Lincoln's Inn Fields & Glasgow

OMOTIVE TANK WITH WATER.

ENGINEWORKS, CREWE.

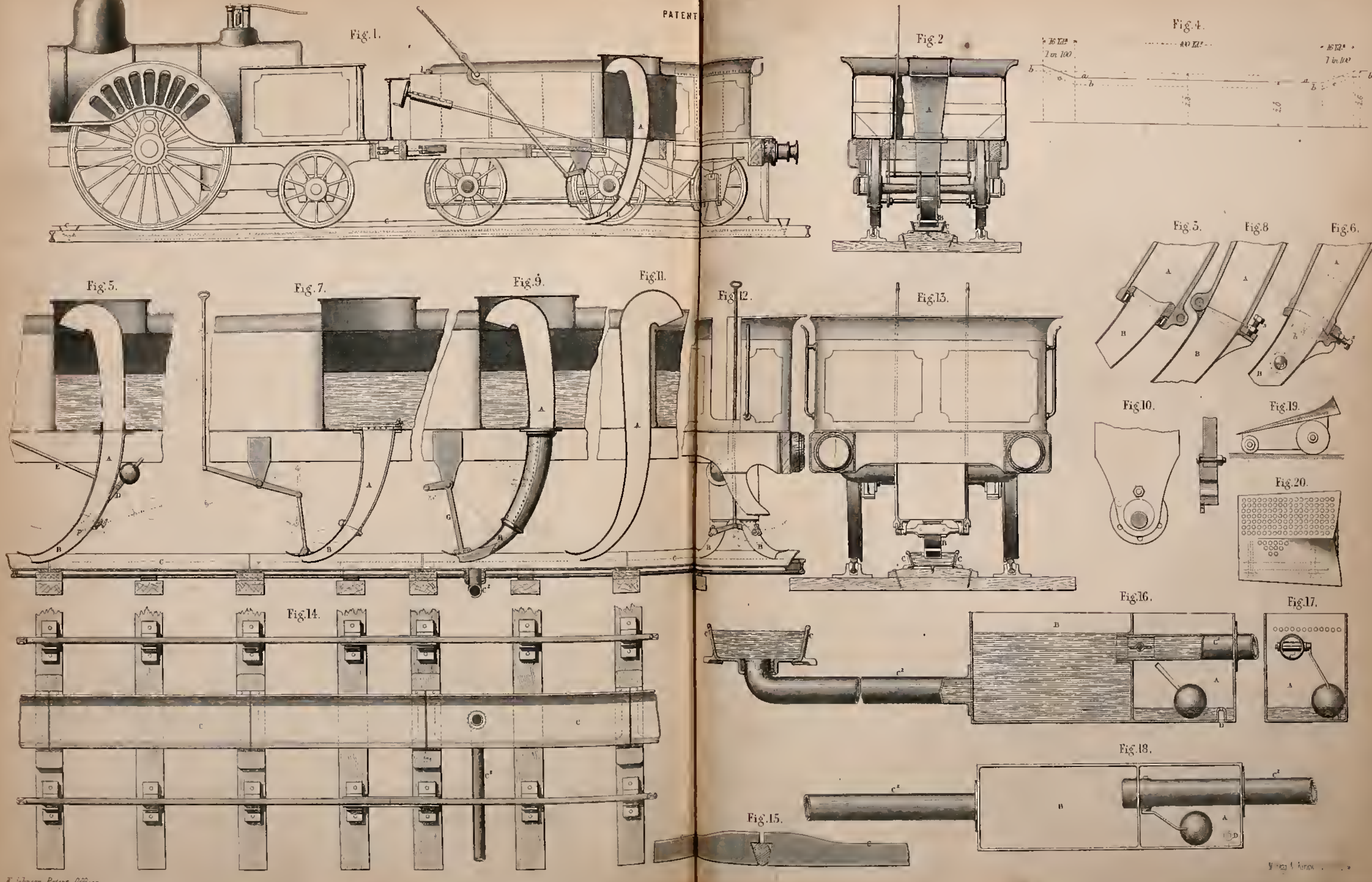


Mackay & Kirkwood ... Glasgow

APPARATUS FOR SUPPLYING LOCOMOTIVE TANK WITH WATER.

J. RAMSBOTTOM, ESQ^R OF THE ENGINEWORKS, CREWE.

PATENT



increased, and if the steam be not brought sharply into action, a portion of its most effective power is lost, for the instant the vapour or steam has a tendency to fall, it is preceded by an instantaneous increase of pressure, and if that rebound be not received, a portion of its effective power is lost. From this it would appear that the more direct the passage of the steam is to the point of physical action, the greater must be the effective power; and where the steam is made to take a circuitous course towards its executive point, it must of necessity lose a considerable amount of its energy. P. Cameron.

APPARATUS FOR FILLING THE TENDERS OR TANKS OF LOCOMOTIVE ENGINES WITH WATER WHILST IN MOTION.

By J. Ramsbottom, Esq., *of the Engine Works, Crewe.*

Illustrated by Plate 269.

Our plate this month illustrates an invention recently patented by Mr. J. Ramsbottom, locomotive superintendent of the northern division of the London and North-Western Railway Company, at Crewe. In times like the present, when every minute's unnecessary delay on a railway journey is deemed of importance, and looked upon as an evil which must be remedied, the arrangements which Mr. Ramsbottom has so ingeniously and practically carried out, with a view to the economy of time, will be regarded by many of our readers with interest.

In order to meet the requirements of the recent alteration in the mail service between London and Dublin, Mr. Ramsbottom turned his attention to the devising of means by which the hitherto inevitable stoppages for taking in water might be avoided, and the engine and tender enabled to take in their proper supply whilst running at their usual express speed. This is accomplished by the employment of a moveable dip pipe in connection with the tender or tank, and a long water trough placed either between or alongside the rails of the permanent way. The dip pipe is so formed that its lower end or mouth acts as a curved scoop when passing through the water in the trough, and by its velocity of motion impels a body of water up the pipe, which flows out at the top into the tender or tank. The idea is both simple and novel in its application, and is found to answer admirably.

Fig 1 (plate 269) represents a portion of a locomotive engine and tender, the latter shown partly in section, provided with one arrangement of Mr. Ramsbottom's apparatus for taking in water; and fig. 2 is an end view of the tender. A, is the water supply pipe, which may be fixed inside the tender; it is slightly curved throughout its entire length, and is expanded towards its upper end to about ten times the area of the bottom, in order to reduce the speed or force of the incoming stream, which is directed downwards by the bent end, or delivering mouth at the top of the pipe. To the lower end of this pipe is fitted a moveable dip pipe, B, which is curved forward in the direction of the motion of the tender, so as to act as a species of scoop. This dip pipe is rendered moveable and adjustable in various ways, with a view to its being drawn up clear of any impediments, such as ballast heaps, lying on the way, and also to regulate the depth of immersion in the water of the feed water trough, C. In the figures before us these requirements are provided for by making the pipes telescopic, the dip pipe being capable of sliding up inside the feed pipe by a convenient arrangement of rods and levers, which will be readily understood on referring to fig. 1. An enlarged sectional detail of this telescopic arrangement of the dip and feed pipes is shown at fig. 3. In order that the dip pipe may enter and leave the feed trough freely at each end, the rail surface at that part of the line is lowered a few inches, a descending gradient at one end of the trough serving to allow the dip pipe to descend gradually into the trough, whilst a rising gradient at the opposite end enables it to rise out of the trough again, the intervening length of line between the two gradients being level. This will perhaps be more clearly understood on referring to the diagram, fig. 4, where *a* represents the trough, which may be about a quarter of a mile in length, and *b*, *b*, the surface of the rails. *c*, *c*, are the gradients coinciding with the extremities of the trough, the bottom of the trough at the ends being, by preference, of a corresponding inclination to the gradients, as shown in the diagram referred to, which, we may remark, is drawn to a distorted scale in order that the gradients may be seen more distinctly. Fig. 5 represents a sectional view of another mode of elevating the dip pipe. In this case the dip pipe is hinged to the lower end of the feed pipe by a pin, *p*, and side lugs, *l*, on the feed pipe, as shown clearly in the enlarged detail, fig. 6 *s*, is a small adjusting screw for regulating the height of the mouth of the dip pipe. A counterweighted lever arm, D, fast on the pin, *p*, and connected to the rod, E, enables the dip pipe to be elevated or depressed with facility. In fig. 7, the dip pipe, is simply hinged to the front edge of the bottom of the feed pipe, an adjusting screw, *s*, (shown more clearly in the enlarged detail, fig. 8), regulating the exact height of the dip pipe so as to suit the level of the water in the trough. A simple arrangement of weighted lever and rods, which require no further description, serves to effect the raising or lowering of the dip pipe. In fig. 9 the dip pipe is shown as connected to a flexible hose pipe, which will admit of the former being lifted bodily, as shown by the dotted lines. In this arrangement the lifting lever arm, G, is rigidly secured to the dip pipe, in lieu of being jointed thereto, as in the previous modifications. The accurate adjustment of the height of the dip pipe, apart from its raising and lowering movements through the intervention of the lifting mechanism, is accomplished in figs. 1 and 9, by means of an eccentric bush, shown in enlarged detail, side elevation, and section, at fig 10; this eccentric bush carries the working centre of the elevating lever arm, G, so that, by simply turning the bush, the centre will be raised or lowered as desired; this has the effect of raising or lowering slightly the mouth of the dip pipe, the adjusting screws, *s*, shown in figs. 5, 6, 7, and 8, being inapplicable in the modifications we have just referred to. In lieu of having the dip pipe jointed or otherwise connected to the feed pipe, the two pipes may be combined in one, as shown in fig. 11, in which case the lifting of the pipe clear of obstructions, when required, may be effected by a rack and pinion, the rack being fixed on to the side of the pipe. This arrangement affords facility, moreover, for reversing the position of the dip pipe, by turning it in either direction, so as to suit the direction in which the train is travelling. Fig. 12 represents, in side elevation, a duplex arrangement of dip pipes, and fig. 13 is a corresponding end elevation of the same. Here two dip pipes, directed in opposite ways, are used, the one being in action and the other out of action alternately, according to the direction of motion of the train. These dip pipes are hinged to the bottom of the receiving box of a tank engine, and are each raised and lowered by independent mechanism of their own, which is clearly illustrated by the diagrams. The water supply trough itself is composed of a number of lengths bolted down on to the sleepers, as shown in the general plan of the way at fig. 14; and the joint between each length or section is rendered watertight by the interposition of a packing of vulcanized India-rubber, as shown in the sectional detail of one of the joints, fig 15. This compensates for expansion and vibration. The height of the trough is so adjusted that the surface of the water therein will be about two inches above the level of the rails, and the supply of the water is obtained, by gravitation, from springs or other natural sources, or is pumped into the trough when the nature of the position requires it. Each trough is provided with a waste pipe; but, in order to economise water when required, and still keep up the supply, an ingenious self-acting water supply regulator is employed. Figs. 16, 17, and 18, represent respectively a vertical longitudinal section, a transverse section and plan, of such an arrangement in connection with the water trough, C. A and B, are two tanks. The water from the source of supply is allowed to enter by the pipe, C^1, which is provided with a throttle valve, I, worked by a ball float, as shown in the tank, A. The water passes from the tank, B, direct to the trough, C, by the pipe, C^2, the level of the water in this tank corresponding with that in the trough. Now, in order to prevent an undue supply of water to the trough, a row of overflow holes (see fig. 17) is made in the partition which separates the two tanks. The height of this row of holes corresponds with the proper water level in the trough; consequently any excess of water supplied to the tank, B, will run over into the tank, A, and close the valve by raising the ball float, at the same time stopping any further supply. This elevation of the ball float is accomplished by the excess of water which enters the tank, A, over and above that which is constantly leaving it by the contracted waste pipe, D, so that when the excess of overflow from the tank, B, ceases, by reason of a passing train having partially emptied the trough, the level gradually subsides in the tank, A, and the valve is again opened until the water has recovered its proper level in the trough. In order to meet all emergencies, Mr. Ramsbottom has provided a small ice plough, shown in side elevation and plan, at figs. 19 and 20, to be used occasionally during severe frost for the purpose of breaking up and removing any ice which may form in the trough. This plough consists simply of a small carriage mounted on four wheels, and provided with an angular-inclined perforated metal top, which works its way under the ice on being pushed along the bottom of the trough, and effectually breaks it up, and discharges it over each side. As a proof of the efficiency of the entire apparatus, we may inform our readers that a trough, laid down some few months ago on the Chester and Holyhead line, near Conway, has been in constant use during the late severe winter—a test which proves its practicability in all weathers.

With the arrangement as now described, it is found that from 1000 to 1200 gallons of water can be picked up, at speeds ranging from fifty to as low as twenty-two miles per hour. This latter is an important fact, as it proves its applicability to goods and mineral trains, which, on account of the great quantity of water they require, are frequently stopped for the sole purpose of filling the tender, and are, in consequence, often delayed from having to shunt out of the way of passenger trains; thus increasing the time on the journey, the damage to couplings and rolling stock generally in shunting, and the risk of obstructing other trains. It may also be mentioned that as it is necessary that the trough should be put down where the trains are running at speed, and at a low level, it follows that by this plan numerous sources of water supply may be rendered available without pumping, which are now too far from a station to be of use.

ENGRAVING ON GLASS.

This process is based on the well-known fact, that fluoric acid will not act upon certain unctuous and resinous bodies. The inventor, M. Gugnon, prefers using asphaltum, to which he adds one-sixth part of gum-mastic, and reduces the whole to a very fine powder.

The design may be traced on copper, lead, tin, zinc, &c., or on paper, parchment, or prepared or unprepared stuffs. If traced on metal, the design is formed by the action of acid; if traced on paper or stuffs, some sharp-edged instrument, or a punch, or a matrice, is used for this purpose.

The metal or other substance thus prepared is laid on the glass, and all the parts which are to be acted upon by the acid are covered, whilst those parts that are not to be so acted upon are left uncovered. The mode of applying the process is as follows:—

The glass is placed in a horizontal position, and covered with a light coating of varnish, or any greasy matter (M. Gugnon prefers spirits of turpentine); the design is laid on this coating while fresh, and very finely powdered asphalt is sifted over it. When a sufficient quantity of powder has been sifted, the design is carefully removed, when those parts of the glass upon which the acid is intended to act will be free from powder, and *vice versa*. The glass is then submitted to a gentle heat, which will cause the essence of turpentine to combine with the asphalt and the gum-mastic, and the mixture soon melts and adheres to the glass. Such portions of the design as are not covered with powder are then edged round with a preparation of soft wax, and fluoric acid poured over them. The acid, confined by the wax, acts upon the glass in about forty minutes, and the process is terminated.

In order to expedite the process, instead of a sieve M. Gugnon employs a box with a semi-cylindrical shaped bottom, about 6 feet in height, 9 in length, and 3 in width. At the bottom of the box, and in a line with its axis, is a shaft, to which are fitted fans similar to those of a winnowing machine; to these a rotatory motion is given by means of a crank, and the powder made to fly about, and to be suspended, as it were, in the air for a moment. At this moment a shelf, on which the design has been prepared beforehand, is rapidly pushed through an aperture left for this purpose on to two inside grooves, and is placed on the glass, covered with spirits of turpentine. In five minutes the shelf is withdrawn, and the design removed with care. The advantage of using the box is this: the powder falls more evenly on the design, and a sharper contour is obtained.

By this process, more designs can be reproduced in a day than the most experienced workman could finish in a month. Two workmen can engrave, in the most complicated designs, about twenty superficial yards of glass in a day.

NEW METALLIC ALLOY.

A new metallic alloy has recently been discovered by Messrs. Mourier and Vallent, to which the discoverers give the euphonious title of "oréide." It is composed of the following ingredients:—

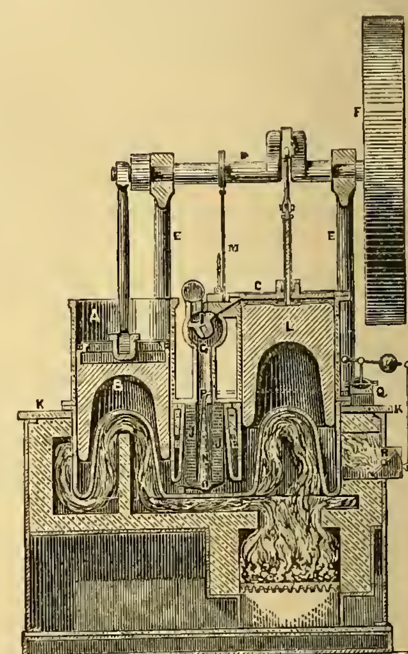
Pure copper,........................	100 parts by weight.
Zinc,....................................	17 ,,
Magnesia,.............................	6 ,,
Sal ammoniac,........	3 60 ,,
Quick lime,...........................	1 80 ,,
Tartar of commerce,..............	9 ,,

This alloy is an excellent imitation of gold. In producing it the copper is melted in a crucible, and to it are added, either together or separately, little by little, in the form of powder, the magnesia, sal ammoniac, lime, and tartar. The whole is to be well stirred for about thirty-five minutes, when the crucible is uncovered, and the scum or dross carefully removed, after which the metal is poured into moulds composed either of moist sand or of metal. This alloy melts at a temperature which will admit of it being readily cast into any ornamental form desired; its grain is fine, and it is found to be highly malleable and capable of receiving a most brilliant polish. When tarnished by long exposure to the oxidising effect of the atmosphere it may be re-brightened by the application of a little acidulated water. By substituting tin for the zinc, the brilliancy of the alloy is said to be greatly enhanced.

HOT AIR OR CALORIC ENGINE.

In another column of the *Journal* will be found a letter from our old correspondent and contributor, Mr. T. D. Stetson, of New York, in which he refers to the "Wilcox air engine," as being about to be manufactured on an extensive scale by several engineering firms in America. This air engine has been patented in this country in the name of Mr. J. H. Johnson. A very favourable opinion was expressed by Professor Rankine on this class of engines, at one of the recent meetings of the Mechanical Engineers of Scotland. An abstract of the proceedings will be found in another part of the present number. We doubt not that many of our readers will peruse with interest the full particulars we here give of the "Wilcox engine."

A, is the working cylinder, and B, the single acting working piston or plunger; C, is the changing and supply cylinder, and L, the piston working therein, which, for the sake of simplicity of description, is for the present assumed to be a single light piston; D, is the main shaft, supported by the frame, E, and having two cranks, and set nearly at right angles with each other; F, is the fly-wheel; G, the valve-chest communicating with the chamber, H, and provided with three ports. Within this chest works the valve, I. The small chamber, H, contains a regenerator, J, resting upon a central cone. At the lower end of the chamber, H, there are two nozzles or openings, and one of which opens into the cylinder, A, and the other into the cylinder, C, and they form a communication between the chamber, H, and the cylinders. The lower portions of the cylinders, A and C, and chamber, H, form the heating surfaces. The bed-plate, K, is supported by the brick-work, and the cylinders, A and C, are supported near their centres by a flange resting on the bed-plate, K, their lower ends projecting into the flue below to receive the heat of the furnace. The cylinder, A, is open at its upper end, whilst C is closed by a tight head. The pistons, B and L, are made somewhat longer than their stroke, and are filled with some non-conducting material, in order to keep their upper sides as cool as possible. The piston, B, is connected by the rod with a crank over head, whilst the piston, L, has a rod passing through a stuffing-box, and is connected by a short connecting-rod with the other crank on the shaft, D. The valve, I, is turned so as to fit accurately the interior of the valve-chest, G, and has a hollow throat of sufficient width to span two adjacent ports. This valve receives an oscillating or partially rotating motion, in the following manner:—the axis of the valve passes through the valve-chest, G, and it has a slotted lever on one end. In this slot works a roller, which is carried on a lever, I, which is in its turn moved by the eccentric-rod, M. The regenerator, J, consists of a hollow cylinder, composed of several thicknesses of wire-cloth. Its internal diameter is of the same area as the ports in the valve-chest, and its external diameter is greater according as the thickness of the regenerator is increased. As the course of the cold air is from the centre of the regenerator outwards, and as the air commences to receive heat and expand immediately upon entering the regenerator, and constantly receives more heat until it escapes at the periphery, much increased in volume, it is evident that the area of the passage-way should increase from the cold to the hot side. This is effected by the peculiar construction of the regenerator, the outside of the wire cylinder having about double the circumference of the inside, and giving an area of passage-way proportioned to the bulk of the air at all points, whether its motion be from the cold to the hot side or in the reverse direction. Within the regenerator is the cone, N, filling it at the bottom and coming to an apex on a line with its top, thereby giving a large area for the cold air to pass in at the top, whilst, as it flows off laterally through the regenerator, a less area is required below. The taper of the cone, N, gives the proper area at all points, and allows no more space for air than is absolutely required. For the same reason, the chamber, H, tapers outwardly from the top to the bottom of the regenerator.



The same effect is produced with a regenerator made of thin plates of metal, by making the spaces either wider or thicker at the hot than at the cold end. A very convenient and desirable manner of constructing a regenerator of plates, in lieu of wire-cloth, is to prepare a series of thin plates, much broader at one side than at the other, but of uniform thickness throughout, and riveting or bolting them together with washers of a uniform thickness interposed between each plate and the next. The regenerator thus formed may then be tightly fitted into a case of corresponding wedge-like form, the narrow end being uppermost, or towards the cold end of the cylinder.

The vessel, O, rests upon the bottom of the chamber, H, so as to be heated as nearly as possible to the same temperature as the metal upon which it lies. From this vessel a small tube, P, passes upwards through the cone, X, and thence through the side of the valve-chest, G, and is connected with the chamber, Q, below the elastic diaphragm fitted therein. Upon this diaphragm rests a small plate, having a rod connected with a weighted lever. A link connects this lever to another lever on the end of the spindle of the damper, R, in the flue. The cylinder or vessel, O, is filled with some fluid that vaporises at a high temperature, such as mercury, which will commence evaporating at about 650° Fahr. When this temperature is attained, a portion of the fluid will be forced through the tube, P, raising the diaphragm in the chamber, Q, and the lever, by which means the damper, R, is closed, the combustion in the furnace is checked, and the temperature of the heating surfaces reduced. As the temperature falls, a portion of the vapour of mercury is condensed, and the diaphragm sinks until the damper, B, is again opened and the fire quickened. Thus the temperature of the heating surfaces is uniformly maintained at about the point which the metal can safely bear. It is evident that the temperature of the heating surfaces can also be regulated by connecting the lever with a slide arranged to admit cold air above the fire, which will cool the heaters both by direct contact with them and also by filling the chimney with cold air, which will retard or check the draft

This portion of the engine is of great practical importance, as the change effected in the structure of the metal, in consequence of being too intensely heated, has caused the failure of some otherwise successful hot-air engines. It must be observed that the vessel, O, is not in contact with the products of combustion, and that the motion of the diaphragm in the chamber, Q, by lever and damper, R, does not necessarily, and should not in many instances, correspond with the fluctuations in the heat of the fire. The vessel, O, is within the chamber, H, and is in contact with the inner side of the heating surfaces at its base Now, the heat of the products of combustion is only one of the elements which tends to control the temperature of the vessel, O, the other being the power with which the engine is working. If the engine be working very moderately, and with little or no load, the temperature of the vessel, O, may rise very nearly to the same point as that of the products of combustion; but when it is working under the opposite conditions, the larger quantity of air which is warmed in any given period tends to cool the interior of the heating surfaces, and in order to maintain a uniform heat in the metal it is necessary that the temperature on the exterior be considerably higher than before. The apparatus is therefore intended to maintain a uniform temperature—not in the gases either on the exterior or interior, but in the metal of the heating surfaces,—and to produce this result by so regulating the draft through the fire as to supply just sufficient heat under all conditions. This feature of the invention is especially important when the engine is frequently stopped, as without it the metal is liable to become heated to a bright red heat in a short time, and to become too much or too suddenly cooled when it is again put in motion.

The furnace is supplied with fuel through a suitable fire-door, and the products of combustion pass from the furnace and circulate around the bottoms and sides of the cylinders, and finally escape to the chimney through the flue, in which the damper, R, is fitted. By allowing the products of combustion to circulate in contact with the end of the working cylinder, as well as with that of the changing cylinder, the inventor is enabled greatly to increase the area of the heating surface without, at the same time, increasing waste space. If the air were passed through a pipe of sufficient length to give the same amount of heating surface as the cylinder bottom, the pipe must have sufficient area throughout its length to allow a free passage of the air, which involves an amount of waste space that would seriously reduce the power of the engine; but in this invention the lower end of the piston is so formed as to fit the cylinder bottom, and as at the end of its stroke it comes within a short distance of it, the waste space is comparatively small.

In this engine a measure of air is transferred from the cold to the hot side of the changing piston, and by its expansion the working piston is forced up, and power is imparted to the engine. But at or about the termination of the up stroke of the working piston the difference becomes apparent, for at this juncture the valve, I, by its rotation, opens the eduction port, and allows the air to escape, while it also opens the induction port. As the changing piston descends, the space above it is filled by a supply of fresh (or relatively fresh) air drawn either from the atmosphere or from a reservoir. When this engine is worked with the air at only about the atmospheric pressure the fresh air is drawn directly from the atmosphere, as represented, and the hot air beneath the two pistons is discharged and blown away. But it can, if desired, be worked in the same manner under a higher pressure, by connecting a reservoir with the eduction and induction ports. In such case, air is compressed by a pump until it fills the reservoir to any pressure desired, and the pressure within the engine will correspond therewith, and thus produce a greater effect at each stroke; but when worked in this manner, the engine must be provided with a refrigerator analogous in structure, though not in arrangement and effect equivalent, to Stirling's.

This engine differs from Stirling's in the following points, viz.—Stirling's alternately transfers the same air from the cold to the hot side of the changing piston, and *vice versa*, whilst this discharges the hot air and draws in a supply of other air at each stroke. Stirling's involves a loss of space in the refrigerator, which is analogous in effect to that caused by what is known as a "clearance" in steam engineering, which loss the inventor avoids; because, when the ports communicate with the atmosphere, no refrigerator is employed, and when they communicate with a reservoir of compressed air, the refrigerator is outside of or beyond the valve, and its pipes and fittings form a portion of the reservoir, and not a portion of the space within the cylinders. The space involved in the refrigerator is not therefore equivalent to clearance in this engine, and is of no effect whatever in the same.

The peculiar motions of the two pistons in relation to each other could be effected by means of cams, but cranks afford a smoother motion and allow of more rapid action, from the tightness at which the parts can be maintained, and the very gradual manner in which the changes occur. For this reason the two cranks are placed at nearly right angles with each other. The inventor finds that the engine performs best when one crank is about 75° forward of the other.

In this engine the pressure acts only in one direction to force the piston up, the momentum of the fly-wheel serving to complete the downward stroke against a gradually increasing back pressure; but by obvious means two air engines of the character herein represented may be combined so as to form a double-acting engine. In operating the engine as above described, a considerable loss of effect is experienced, from the fact that heat is conveyed through the material of the changing piston and imparted to the air immediately on its entering the space above it. The heat thus imparted to the air first received causes it to expand and obstruct the ingress of that which should follow. The result of this is, that less air is received than would be required in a cold state to fill the space formed by the sinking of the changing piston, and less power is therefore developed by the engine. It is also found that much heat is conveyed upward through the working piston, and that the top of the same becomes so highly heated that the lubricating material is injuriously affected, unless much care be taken to prevent it. This evil can only be partially remedied by increasing the thickness of the piston, and any such increase of the material involves serious difficulties by increasing the size of the engine and the inertia of the parts. The changing piston, L, is therefore constructed in two parts, as shown in the figure. The lower part is made hollow, and is filled with ashes or other good non-conducting material, and is of slightly less diameter than the cylinder, so that a narrow annular space is left between its periphery and the interior of the cylinder, C. The two parts are secured rigidly together by webs, or other equivalent connections; but the connecting parts are not of sufficient area to be of much effect in conveying heat from one to the other. In the space between the two parts of the piston an annular or other self-acting valve is provided, which allows the air to flow at pleasure from the upper or cold side of the piston, L, to the lower or hot side, but prevents its return. The operation of the engine as thus arranged is as follows:—Upon the descent of the changing piston, L, the air is drawn in through the valve, I; but when it rises, instead of all the air passing through the valve-chest, I, and the regenerator, H, a portion passes through the valve between the two parts of the lower piston, and thence around the outside of the part, where it is heated and expanded, and serves to impel the engine, by forcing up the piston. When its useful effect is ended, it is discharged through the valve, I, the valve at the top of the piston, L, closing to prevent its returning again to the top of the cylinder, C. By this conveyance of a portion of the inducted air between the lower part and the upper part of the changing piston, the heat which is conducted or radiated upwards into the top part is removed by the stream of air which is passing; and the inducted air, instead of playing directly upon the heated top of the part and becoming prematurely expanded, with the ill effect of thereby preventing the ingress of the full and proper quantity of air, plays upon a cool surface on the top of the part, and is not allowed to come in contact with the lower part until the piston, L, begins to ascend. The proportion of the air which it is necessary to pass through the piston in this way for this purpose, is determined by the amount to which the valve at the upper part of the piston, L, is allowed to open. In the working piston, B, a clear space extends across the upper part of the piston, with the exception of a thin shell at the periphery. The lower extremity of the connecting-rod is joined to the piston—not through the aid of a continuous plate, as heretofore, but of an open frame, which extends from the centre to the circumference, forming a strong connection between the rod and the lower portion of the piston, B, but with liberal openings through which the air may circulate. As the piston, B, reciprocates rapidly, the agitation of the air contained in the upper space and of the air immediately above is sufficient to induce a partial displacement of the air at each stroke, so that the space is always filled with air at a comparatively low temperature, which, by its circulation, conveys away the heat conducted upward to the rubbing surfaces. If no air space existed in the piston, or if it were enclosed by means of a tight plate above, so that the contents of the space would not be displaced in part at each stroke, the rubbing surfaces at the top of the piston would have to sustain a much higher temperature, the heat at the bottom of the piston diffusing itself more uniformly throughout its whole substance. The thin tube or sleeve surrounding the rod of the piston, L, is an arrangement which the inventor has devised for actuating the valve at the top of the piston, L, in lieu of or additional to a spring. The friction of the packing in the stuffing-box is thus rendered available for operating the valve. As the piston, L, ascends, this friction tends to open the valve; and the moment the piston begins to descend, the friction, either alone or acting in conjunction with a spring, closes the valve, and holds it tightly closed during the entire descent.

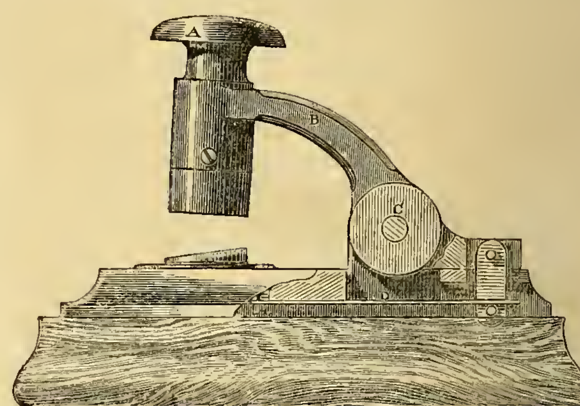
The advantages obtained by this invention are, that pumps and coolers are dispensed with, and, at the same time, the engine is run at high speeds without noise. By employing the ends of both the working and the changing cylinders as heating surfaces, space is economised in proportion, and the power of the engine proportionably increased. The heat regulator protects the heating surfaces from the destructive effects of an extremely high temperature and regulates the fire, thereby keeping the interior of the heating surfaces at a nearly uniform degree of heat under all conditions. The area of the passage-way through the regenerator is proportioned to the bulk of the air at all points, and the resistance to the passage of the air is much reduced. The valve, I, performs the threefold office of induction, eduction, and equilibrium valve with less friction and less liability to derangement than any means previously introduced. The upper part of the changing piston and cylinder are kept at a comparatively low temperature by the circulation of a portion of the cool air through the double piston, L, allowing the full amount of cool air to be taken in at each stroke, whilst, at the same time, the full effect of the regenerator is obtained, or very nearly so. The free circulation of air into the open space in the upper part of the working piston, serves also to keep the rubbing surfaces cool, and prevents also the burning of the lubricating material.

MR. PICHOIN'S MODE OF TREATING SUDS, AND UTILISING THEM FOR MANURE, OR IN MANUFACTURING GAS.

The following is the process employed by Mr. Pichoin, of Nancy, for this purpose. The suds which have been used for scouring and washing the gum out of silk, scouring, bleaching, or washing woollen stuffs, silks, cottons, flax, hemp in flock, thread or textile fabrics (either before or after they have been dyed) for dressing cloth, washing printed calicoes, or washing the grease out of wool, are submitted to a treatment by sulphate or hydrate of lime in sufficient quantity. A calcareous soap is thus obtained, which may be efficaciously used as a manure or in manufacturing gas for lighting. The greasy matter contained in the gas may be separated therefrom by means of chloridric acid. This process is based on the well known chemical fact, that earthy and metallic salts decompose soap. It differs, however, in one respect, from other processes based on the same principle, viz., cheapness. Substances which are to be met with everywhere at low prices, are used instead of alum and chlorure of lime, which are much dearer, and of which much larger quantities are required in order to produce the same effect. If sulphate of lime be used, that with which mortar is made (which contains hydrate) should be selected, and reduced to a very fine powder. If lime be employed, it should be the purest that can be obtained, viz., the white or greasy lime used in commerce, which must be hydrated before use. These substances are mixed with water till they form a cream, which is poured gradually into the suds, which is then stirred till the suds thus filtered, precipitate their solution of carbonate of soda. This calcareous soap precipitates almost invariably after reposing for an hour, and the greasy matter, which does not combine, is carried to the bottom at the same time: the supernatant water may then be thrown away. This separation takes place whether sulphate or hydrate of lime be used, and at whatever degree of heat the operation is performed; but in treating suds which have been used for washing out grease from wool it is best to employ lime, and to operate at 100° centigrade. At the bottom of the pans will be found a recrementitious remainder, which should be placed on a hurdle and covered with linen cloth, on which it will drip and settle. The remainder even then contains a great deal of water, but this is of no consequence, if it is intended to be used on the spot, or at a short distance for extracting therefrom the greasy bodies; but if it is to be removed to any distance, or if it is intended to be employed in manufacturing gas, all the water which does not combine should be extracted, which may be easily done by pressure, but it is preferable to employ heat either before a fire or to let it evaporate in a half-closed vessel; this last mode is the best. The soap and the greasy matters melt, separate themselves from the superfluous water on which they float, and may be moulded like common soap. When this soap is used for removing greasy matter, it is placed in wooden tubs which should be lined with lead. Water acidulated with chloridric acid is added. The tubs are heated by vapour, the greasy matters float, and may be used for manufacturing soap and other purposes. If the water still continues acid, it may be again used for commencing a fresh operation.

PERCUSSIVE EMBOSSING PRESS.

The accompanying illustration represents a side elevation of a percussive embossing press, recently patented by Mr. W. Jones, of 246 High Holborn, London. This is a very great improvement upon the old embossing press, both in point of efficiency and economy. The press from which our illustration is taken, may easily be carried in the



pocket as far as size is concerned, and yet it is capable of producing the most perfect impressions upon paper, by a moderately light tap of the hand on the knob or handle, A. The die is fixed in a short lever, B, centered at C, which is maintained elevated as shown, by a blade-spring, D, concealed within the base of the press. These presses are provided with copper forces, and are mounted on a neat wooden stand, the whole forming a most useful appendage to the writing desk.

STATISTICS OF WATCH MAKING.

It is interesting to observe the development in one town alone (Besançon) since 1848 of this very important branch of manufactures. We have given in a tabulated form below, the numbers of gold and silver watches, and their value, manufactured each year from 1848 to 1856 inclusive, in Besançon:—

Year.	Gold Watches.	Silver Watches.	Value.
1848	3,175	24,447	1,141,595 francs.
1849	6 149	32,431	1,688,495 „
1850	11,235	48,626	2,588,059 „
1851	14,785	53,091	2,983,094 „
1852	19,419	57,052	3,436,236 „
1853	27,742	65,255	4,464,320 „
1854	32,594	73,482	4.795,979 „
1855	49,484	92.459	6,422,568 „
1856	60,511	99,654	7,826,907 „

This shows an increase in money value, taken at a rough estimate, of £274,000 in the nine years, or a rise from £46,000 in 1848, to the enormous sum of £320,000 in 1856. A curious and interesting feature is also disclosed by this table, namely, that on comparing the production of the first year, 1848, with that of 1856, we find it to be in the proportion of about 1 to 20, whilst the relative values of those two years are only in the proportion of about 1 to 7, showing a diminution of about two-thirds on the cost price. These results are entirely owing to the extensive introduction of machinery and steam power of late years in this branch of manufacture.

PORTABLE CARTRIDGE MAKING MACHINE.

A portable and ingenious apparatus for filling cartridges for sporting breech-loading fire-arms, and capable of being packed in an ordinary gun case, has been introduced by Mr. G. Jeffries, of Norwich.

Fig. 1 represents a front elevation of the improved apparatus. Fig. 2 is a corresponding vertical section of the same, looking at right angles to fig. 1, with the rammer depressed; and fig. 3 represents the finishing box detached. A, represents the body or stem of the apparatus, which may be made of cast iron or other metal. The lower part of the stem is

Fig. 1.

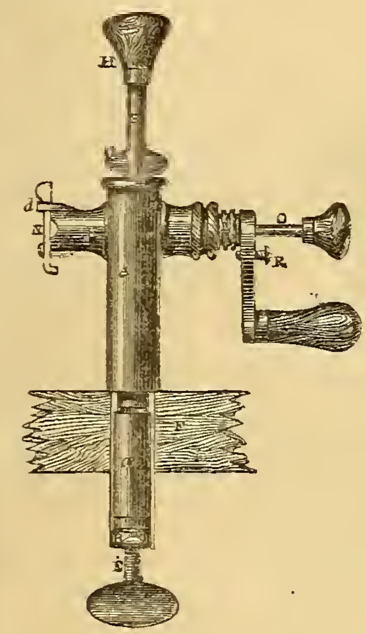
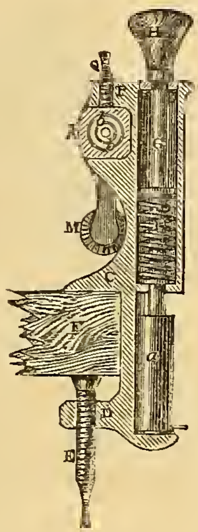
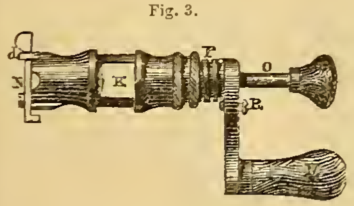


Fig. 2.



recessed or grooved semicircularly to receive the cartridge case, *a*, which rests upon the projection, B. Immediately behind this recessed or grooved portion of the stem are two lugs or shoulders, C, D, and through the lower one, D, is passed the pinching screw, E, which serves in combination with the lugs, C and D, to secure the apparatus to the edge of a table or work bench, F, as shown in fig. 2. The cartridge, which has been partially filled with powder and thick wadding, is placed in the recess or groove above referred to, and is then ready for ramming, which is effected by means of the rammer, G, being suddenly depressed by striking the knob or handle, H, with the palm of the hand. The rammer is elevated again by the helical spring, I, contained within a hollow chamber cast in the stem as shown in fig. 2. The semicircular groove or recess, referred to above, ensures the proper centring of the cartridge case beneath the rammer head. After the wadding has been sufficiently rammed over the powder, the shot and thin wadding are introduced and passed through the same process of ramming, the cartridge is then placed in the finishing box, K, fig. 3, for the purpose of having the end of the case turned over inwards, so as to prevent the accidental displacement of the contents of the cartridge. This is effected by the screwed plug, L, the front or inner end of which is chambered out, and is provided with an annular groove or recess as shown at *b*, fig. 2, into which the lip or edge of the cartridge case enters, and by which it is turned inwards when the plug is forced forward by turning the handle, M, attached thereto. The cartridge is held in position during the finishing process above described by the cross-bar, N, hinged to the mouth of the box, and held by a hook or catch, *d*, fixed to the side of the mouth. When the cartridge is completed, the cross bar is turned back so as to release the cartridge, and the latter is then expelled from the box by the plunger, O. The finishing box is not cast in one piece with the stem of the apparatus, but is made removable therefrom, being held between a pair of lugs, P, by a set screw, Q. This arrangement affords facility for the changing of one box for another, suitable for a different sized cartridge—viz., 12 or 16 gauge—and admits the entire apparatus to be packed in an ordinary gun case, as it occupies no more room than a flask or pouch. The apparatus is one which, from its extreme utility, will doubtless be extensively patronised by those who are in the habit of using fire-arms.

Fig. 3.



EXTRACTION OF THE FECULA FROM THE HORSE-CHESNUT.

Messrs. Nicolle and Deschamps propose to extract the fecula from the horse-chesnut, with a view to its utilisation. For this purpose the chesnuts are gathered when ripe, and divested of their green husk. They are thrown into a heap, and allowed to remain for about fifteen days, to induce fermentation. The outer brown shell or husk is now removed, and the chesnuts are well washed in spring water acidulated to the strength of about 1-20th or 1-10th with muriatic acid, in order to remove their greenish tint and acridness. They are now reduced, by rasping or otherwise, and the product is sifted, to separate the flour, or fecula, therefrom. This fecula is again washed in acidulated water until its greenish aspect and bitter flavour have disappeared. It is now allowed to deposit or settle, and the liquor is decanted off. The flour or fecula resulting from the above mode of treatment is finally laid or spread out upon white linen cloths, and allowed to remain until perfectly dry, when it is ready for use in bread making, or to be mixed with wheat or other flour, or be used alone for other purposes.

RECENT PATENTS.

BLOWING ENGINE.

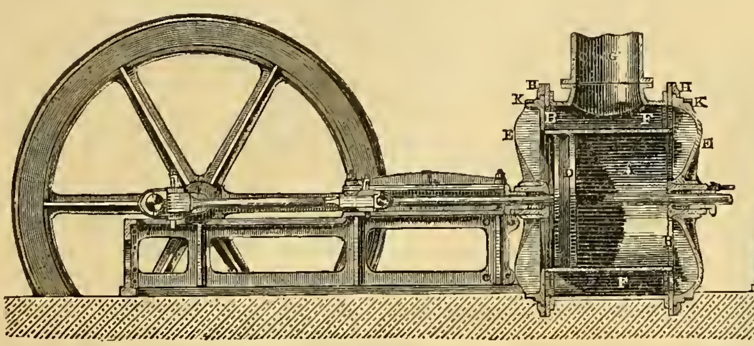
J. H. Johnson, *London and Glasgow*, (E. F. Fossey, *Paris*).—*Patent dated January* 28, 1860.

This invention relates to a peculiar construction and arrangement of blowing engine or machine, applicable either to large works, such as blast furnaces, or as small forge blowing machines. According to this invention the objectionable use of clack or slide valves is obviated, such means of distribution or direction of the air, being replaced by the application to each end of the blast cylinder of a rotatory disc or outer cover, provided with alternate radiating openings and closed channels or air passages. These discs rotate in contact with the fixed ends of the cylinder, which have a number of radiating openings made in them, corresponding to the openings in the rotatory discs, so that when the two sets of openings coincide, as they will intermittently do during the rotation of the discs, there will be a free communication between that end of the cylinder and the atmosphere, whilst the disc on the opposite end of the cylinder is so timed in its rotation, that its air channels will be over the openings in the fixed end of the cylinder. These channels, when in this position, form a communication from the interior of the cylinder to an annular chamber which surrounds the cylinder and communicates with the main blast pipe.

Fig. 1 of the accompanying engravings represents a longitudinal vertical section of one arrangement of the blowing engine; and fig. 2 is a half end elevation and transverse section of the blowing cylinder. A, is the enclosed or jacketed blowing cylinder, cast in one piece with the outer cylinder or jacket, the small cross pieces or ribs, serving as a connection between the inner and outer cylinders. The ends, B, of the inner cylinder are cast with stuffing-boxes upon them, and with inlet apertures, C, and their diameters are equal to the external diameter of the inner cylinder. These covers are fixed tight by means of ground joints and screws, and offer, in conjunction with the ends of the outer cylinder, a perfectly plane surface for the reception of the discs, an annular space being left between the two cylinders. The blowing piston, D, fixed on its rod, is provided on each side with projecting parts which jointly fill the orifices, C, in the cylinder covers, B, in order to reduce as much as possible the otherwise lost space at each stroke of the piston. The end rotatory discs, E, have inlet orifices formed in them, and corresponding with the openings, C, in the cylinder covers, B; they have also intermediate outlet orifices, which open into the annular space, F, and consequently communicate with the lateral outlet pipe, G, on the external cylinder. These discs are provided with teeth on their peripheries, in order to receive a rotatory motion round the stuffing-boxes of the end covers, B, which form the fixed axis of rotation. They are kept pressed against the surfaces of the covers, B, by the rings, H, which are bolted to the edge of the external cylinder. The bolts so employed are provided with washers of caoutchouc, in order to prevent a too powerful gripping of the discs between the rings and the ends of the external cylinder. A horizontal shaft, which is driven from the crank shaft, I, carries two spur pinions, J, which gear with the teeth, K, on the discs, D. This shaft carries at its opposite end a bevel wheel, fixed to a collar by two bolts, so as to enable the orifices of the discs to be regulated or adjusted forwards or backwards. The crank shaft, I, is driven by any suitable prime mover through the intervention of a strap and driving pulley, or it may be driven direct from a steam-engine, the piston of which may, if desired, be fitted on to the same rod as the blowing piston. This shaft carries at one end a bevel pinion, gearing with the bevel wheel on the shaft which drives the discs.

The advantages obtained by the peculiar construction of this blowing machine are—1st, the power of working it at the highest possible speed attainable from a crank, the discs forming no obstacle by reason of their comparatively slow and regular rotation; consequently the size of large or powerful blowing engines may be considerably reduced. 2d, The reduction to any desired extent of the lost space at the end of each stroke of the piston, as by the application to the covers of the cylinder

Fig. 1.



and the face of the piston of an elastic material a complete contact may be obtained between them, whence it follows that every particle of air will be expelled. 3d, The great simplicity of its construction. It may here be observed that the areas of the inlet and outlet orifices are equal to 1-5th of the transverse section of the cylinder or surface of the piston, whilst in the case of slide-valves it is with great difficulty that such orifices are made to obtain 1-8th or 1-7th of the cylinder's area in large engines. In large engines constructed after this invention, if it is desired to reduce still further the speed of rotation of the discs, 12, 16, 24, or more orifices may be made in them, in place of 8 without injury to the good working effects of the machine. In this case it will be necessary to change the proportions of the gearing which rotates the discs.

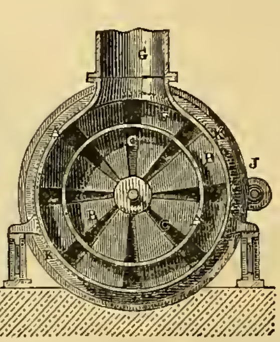
LOOMS.

Thomas Loveridge, *of Philadelphia, U.S.—Patent dated Feb.* 22, 1860.

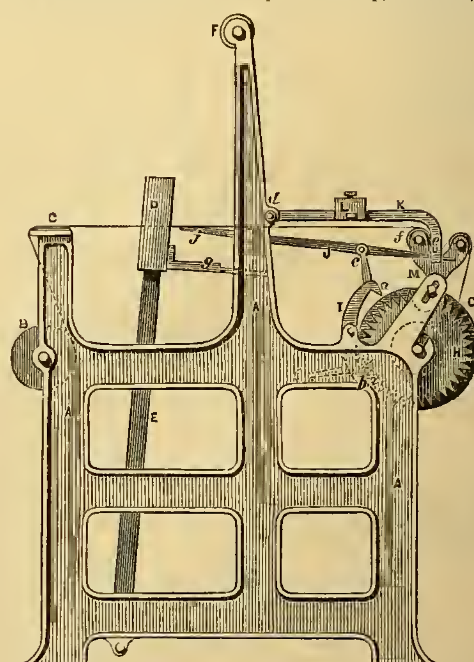
This invention has for its object a certain novel and improved construction and arrangement of self-acting apparatus for letting off the warp and maintaining it at a uniform tension during the process of weaving, these improvements being equally applicable to hand or power looms.

The accompanying engraving represents a side view of an ordinary power loom as fitted with these improvements:—A, indicates the two side frames or standards of an ordinary power loom, connected together at suitable points by appropriate transverse stays; the cloth beam, B, is situated at the front of the loom, and turning in bearings in the side frames; C, is the breast beam; D, the "slay" or "lathe," secured to the slay-swords or arms, E, which work in bearings at the bottom of the two side frames; F, is a spindle for supporting the harness or heddles; and G, is the warp-beam, turning on centres carried in bearings in the two side frames at the back of the loom. The necessary vibrating motion is imparted to the slay or lathe by the cranked driving shaft and connecting-rods common to power looms generally. To one end of the warp-beam, G, is secured an escapement-wheel, H, to the teeth of which are adapted the two pointed projections, *a* and *b*, of the pallet-lever, I, which vibrates on a pin on one of the side frames of the loom, and has a weighted projection or lever, tending to maintain the projection, *b*, in gear and the projection, *a*, out of gear with the teeth of the pallet wheel. On the upper end of the pallet-lever, I, and forming part of the same, is a projecting arm, *c*, to which is hung the horizontal lever, J, which will be more particularly alluded to hereafter. K, are two levers, secured one near each end of a small longitudinal shaft, *d*, which is hung loosely to the opposite frames of the loom. Each lever is furnished with a sliding weight, L, which may be adjusted to any desired position; and the bent ends of the opposite levers are connected together by a pressing-bar at *e*, which is situated between the two rollers, *f*, running in brackets, M, one of which is secured to each side frame of the loom. From the position occupied by the pressing-bar, *e*, in relation to the rollers, *f*, it will be seen that the warp which passes over these two rollers is tightened when the pressing bar descends between them. One of the weighted arms, K, or the end of the bar, *e*, near one of these arms, bears on the end of one arm of the horizontal lever, J, the opposite arm projecting forwards to the back of the lathe, D, to which is secured an arm or finger, *g*. The warp, which is shown by a single line, passes from the beam, G, upwards over the first roller, *f*, under the pressing-bar, *e*, of the levers, K, then over the second roller, *f*, thence through the usual harness and the reed in the lathe to the felt, where it is woven—the woven fabric passing over the breast-beam, C, and thence to the cloth-roller, B, round which it is wound by the usual rachet-wheel and catch, operated by any suitable moving part of the loom, as the lathe. The position of the weighted arms, K, and their transverse pressing-bar, *e*, depends upon the position assumed by the warp between the two rollers, *f*, the bar, *e*, bearing on the warp at this point with a pressure invariably the same. Now suppose the bar, *e*, to be in its lowest position between the rollers, *f* (as shown), as the fabric

Fig. 2.



is wound round the cloth-beam, B, the warp will be stretched, and as the warp-beam, F, is prevented from turning by the pallet-lever, I, excepting on certain occasions referred to hereafter, the warp, which had been previously depressed or drawn down between the two rollers, *f*, will be gradually raised, as well as the bar, *e*, and its levers, K, and their weights, L. Now, the position of the lever, J, depends upon that of the arm, K, against which this lever bears, so that as the bar, *e*, with its arm, K, are raised, the forward end, *j*, of the lever J, will be lowered so as to come within the range of the projection on the finger, *g*, on the lathe. So long as this lever remains elevated above the range of this projection or finger its position is undisturbed, and the pallet-lever continues to prevent the warp-beam from turning, and the warp, consequently, from escaping. The necessary amount of warp to take the place of that woven by the lathe, and taken up on the cloth-beam, is supplied by the gradual rising of that portion of the warp depressed between the two rollers, *f*. When no more of this depressed warp, however, remains to



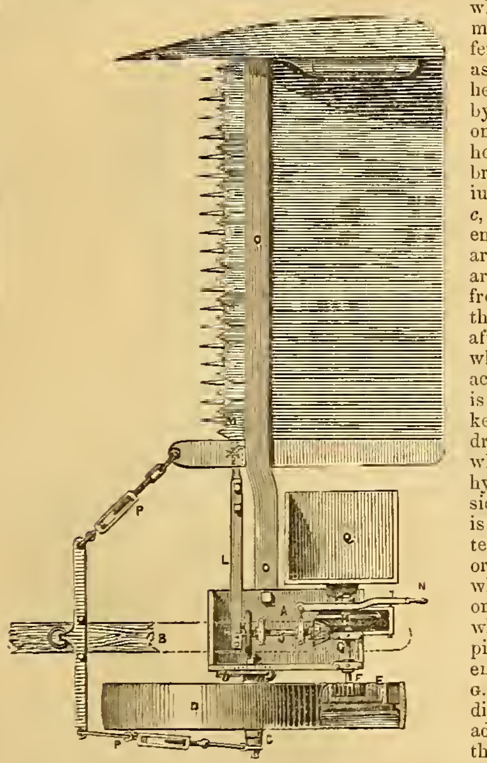
be delivered out, it becomes necessary to abstract another supply from the warp-beam, and it is at the point where the supply of warp between the rollers is exhausted that the forward end, *j*, of the lever, J, comes within the range of the projection, *g*, of the lathe. This projection strikes the end of the lever, J, and moves the pallet-lever, I, so that its projection, *b*, moves out of gear, and the projection, *a*, into gear with the escapement wheel, H. The moment the projection, *g*, is, by the forward movement of the lathe, free from contact with the end of the lever, J, the weight on the pallet-lever instantly restores the latter to its original position. On this sudden movement of the pallet-lever, the escapement wheel will be turned round to the extent of one tooth, and a limited amount of warp will be delivered off. The sudden letting-off of the warp does not in any way impair that uniform tension which is necessary for the proper weaving of the fabric, for the moment this slack is given out it is taken up by the bar, *e*, with its levers and weights, which depresses it between the rollers, *f*, as before described; at the same time, by the depression of the arms, K, the forward end of the lever, J, is raised, and remains beyond the range of the projection, *g*, until another supply of warp has to be obtained from the beam, which becomes necessary when the supply between the two rollers, *f*, has been expended, when a repetition of the above described movement then takes place as before.

REAPING MACHINE.

Joseph Nicholson, *Whitehaven.—Patent dated May* 17, 1860.

Mr. Nicholson, who is a practical agricultural implement maker, has directed his attention to the arrangement of the reaping machine, so as to balance it in such manner as to avoid unnecessary weight upon the horses, whilst, from the peculiar position of the draught-pole, side draught is entirely prevented.

The annexed engraving represents a plan of the improved reaping machine. A, is the cast-iron bracket; it is bolted to the draught-pole, B, and is provided with a stud-pin, C, which carries the main driving-wheel, D. This pin may be placed at different elevations, so as to regulate the height of the cutters, by inserting it into one or other of the holes formed in the bracket. It is secured in its place by a nut, *c*, as shown in the engraving. The holes are disposed in the arc of a circle struck from the centre of the shaft, G, hereinafter referred to. The whole of the cutter actuating mechanism is carried by the bracket, A. The main driving-wheel, D, which is supported by the pin, C, in the side of the bracket, is provided with an internal toothed wheel or circular rack, E, which gives motion, on the rotation of the wheel, to the spur pinion, F, fast on the end of the short shaft, G. By the peculiar disposition of the adjusting holes in the bracket, A, as before described, the pinion, G, will always be in gear with the internal rack, at whatever height the machine may be adjusted. This shaft works in bearings bolted to the base-plate of the bracket, and carries a bevel wheel, H, which gears into a bevel pinion, I, fast on the end of the short shaft, J—cast in one piece with the bracket, A. The shaft is protected from clogging by a semicircular casing on its under side, and works on bearings also bolted to the base-plate of the cast-iron bracket, A, and carries at its opposite end a disc and crank-pin, K, which impart motion, through the connecting-rod, L, to the ordinary knife or cutter. N, is a lever-handle for throwing the cutting-gear out of action when required. The angle of the draught-pole, B, may be regulated by suitably adjusting the bolts in one or other of the bolt-holes made for that purpose at the back and front ends of the bracket. The end of the finger-bar, O, is bolted to a lug cast for that purpose on the bottom of the bracket, A; and in order to maintain the finger-bar and platform firm and steady at right angles to the draught-pole, adjustable stays may be used, as shown at, P. On this is the seat, Q, of the attendant who directs the machine.

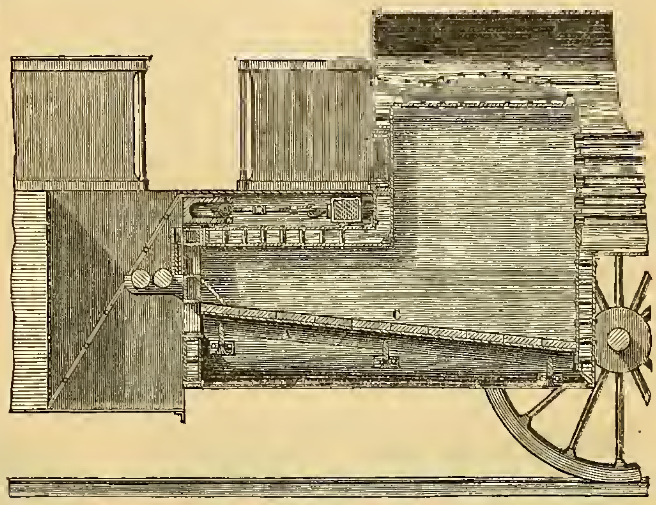


SMOKE-CONSUMING FURNACES.

J. H. Johnson, *London and Glasgow* (N. F. Corbin, *Paris*).—*Patent dated January* 3, 1860.

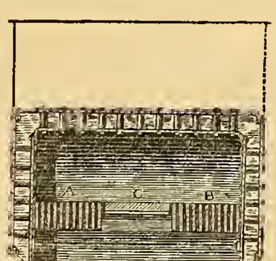
The improvements specified under these letters patent relate to the arrangement and construction of furnaces and fireplaces, whereby a more perfect and economic combustion is accomplished, and the emission of smoke prevented. These improvements are equally applicable to all furnaces and fire-places fitted with fire-bars or grates. In furnaces, the surface supporting the fuel is divided into three portions, by constructing along the centre thereof, so as to subdivide the said surface into two smaller grates of equal area, a dead surface of fire-brick, supported upon iron plates, and having a superficial area about equal to one of the two grates. The front of the furnace so constructed is provided with a wide feed aperture, extending in front of the two grates and dead surface. This aperture is divided into three lengths by means of vertical hollow columns of cast-iron, by which air is allowed to enter freely, and these apertures are closed either by loose fire bricks and small coal or by sliding iron doors. In front of the central opening a horizontal roller or rollers are placed, upon which the shovel of the stoker is supported when being introduced into the furnace with fuel, and the vertical columns above referred to, serve as lateral rests or bearing-supports for the poker or other tool used in stirring the fuel and pushing it on to the grates from off the central dead surface, upon which all the green coal is first deposited when feeding the furnace. By this means the fresh coal is allowed to distil effectually upon the heated fire-brick dead surface, before it is pushed on to the grates on either side of it. An air aperture may be formed, in some cases, leading to the dead surface, whereby more or less air may be admitted to the fuel under the process of distillation as required, whilst at the same time facility is afforded for the introduction of a poker to loosen and stir up the caking fuel on the dead surface.

Fig. 1.



In applying these improvements to the existing open fire-grates for domestic purposes, the whole of the fire holding portion of the grate is surrounded by fire-brick, and a considerable portion of the back of the grate is occupied by a fire-brick dead surface of about half the entire depth of the grate from back to front, and extending laterally to within a short distance of the sides of the grate, so that this dead surface will be enclosed on the front and two sides by the horizontal bars of the fire-grate, and bounded on the back by the fire-brick back of the grate. This back is made to project considerably forward, so as to overhang the dead surface, and form a species of combustion chamber at the back of the grate, the mouth of such chamber leading by a covered passage into the flue or uptake.

Fig. 2.



The accompanying engravings represent two views of a locomotive furnace constructed according to this invention. Fig. 1 is a longitudinal section; and fig. 2 is a cross section through the fire-box, corresponding to fig. 1, and represents the grate divided into two equal parts, A and B, and also the dead surface of fire-brick, C, upon which the distillation of the fresh fuel takes place and the combustion of its gases is effected. The lower part of the fire-box is extended forward beneath the ordinary foot-plate towards the tender, the bottom of which is considerably lowered, as shown in the engraving, fig. 1, for the accommodation of the stoker, the fire-door being in the lower or extended portion of the fire-box. Fig. 2 represents a transverse section of the extended portion of the fire-box, and shows the two divisions of the grate with the dead surface between them. The divided fire-grate, with the fire brick dead surface, C, may thus obviously be employed in all cases where an ordinary or other grate has been hitherto used.

FURNACES.

JAMES ROBERTSON, *Middlesex.—Patent dated April* 3, 1860.

THE improvements specified under these letters patent relate to a peculiar construction and arrangement of steam-boiler and other furnaces or fire places, whereby economy of fuel and prevention of smoke is effected.

Fig. 1 of the annexed engravings represents a longitudinal vertical section of one arrangement of the improved furnace as applied to an ordinary internal flue steam-boiler; and fig. 2 is a partial end elevation of the same and partial transverse section taken through the fire-bars. A, is the body or shell of the boiler, and B, the internal flue, in which the improved furnace is constructed. C, are the fire-bars, and D, the ash-pit. These bars are supported at their extremities in suitable bearers, E, and may be made of any shape which will admit of their revolving each on its own longitudinal axis. In the drawing they are represented as being made of a circular section. These bars may be either plain or may have a number of slots or perforations made transversely in them, so as to admit of a free passage of air through them into or amongst the fuel, and may be provided with a spiral groove on their surfaces, so that when the bars are rotated the grooves will tend to draw forward the cinders and any clinkers which may be formed towards the mouth of the furnace, to be there discharged. Various mechanical contrivances may be used for imparting a rotatory or circular vibratory motion to the entire series of bars, but it is preferred to employ the arrangement shown in the engravings, which consists in securing a spur pinion, F, on to the end of each bar, such pinions gearing together so as to form a train of gearing, which, on receiving motion by means of a winch handle, G, will transmit such motion to the entire series of bars. In order to protect the teeth of these wheels from clogging by the dropping therein of pieces of coal or cinders, it is proposed to cover them over by the dead plate, H. By occasionally turning the fire-bars in the manner above described, they will last much longer than the ordinary fixed ones, as all parts will be equally subjected to the action of the incandescent fuel, whilst at the same time the formation of clinkers upon them will be entirely or in a great measure prevented. Immediately below the fire-bars, and in close proximity thereto, a plate, I, is hinged at its back end to the sides of the ash-pit whilst its front end is free to be raised or lowered nearer to or further from the bars, according as more or less draught is required, a counterweight and chain attached to its front edge serving to facilitate this adjustment. An opening or space, K, is left between the back ends of the fire-bars and the bridge, L, and over this opening is placed a grating, M. When a charge of fresh fuel is introduced into the furnace, the front end of the plate, I, is elevated so as to bring it within a few inches of the fire bars, and the air which enters below the grate consequently passes between the surface of this plate and the undersides of the fire-bars. As this plate becomes considerably heated by its close proximity to the incandescent fuel on the grate, and as it receives the hot cinders and unconsumed fuel which drop from the grate, it follows that the air, as it passes along between the bars and the plate, will become heated, and will receive an additional degree of heat by passing through the highly heated grating, M, which also subdivides it into a number of streams or jets, in which form it mingles with the carbon and unconsumed gases as they pass over the bridge, and effectually prevents the formation of smoke. As the combustion of the fresh fuel proceeds, the plate, I, may be gradually lowered, so as to reduce the draught, thereby regulating the supply of air according to the requirements of combustion.

Figs. 1 and 2 represent the plate, I, in its lowest position, in which state the cinders and ashes may be readily removed from it into the front of the ash-pit. In order to adapt this plate to the semicircular form of the ash-pit, and so allow of its descending to the required extent, the patentee proposes to attach hinged flaps, O, to the sides of the plate, which flaps will gradually fold up as the plate descends, as shown in fig. 2. By the application of the plate, I, below the fire-bars, the great loss and radiation of heat from the ash-pit into the stoke hole, which is found so objectionable in steam-boats, is prevented, as this heat is carried inwards to the flues by the draught beneath the fire-bars.

Fig. 1.

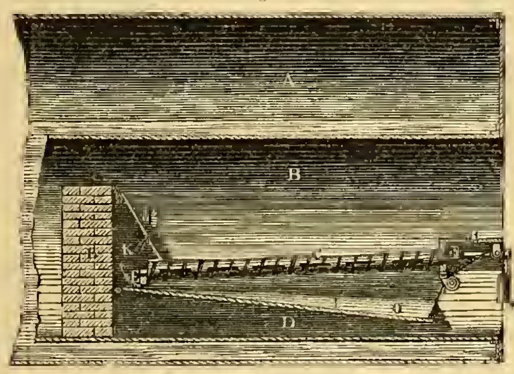
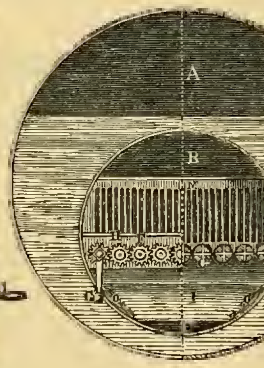


Fig. 2.

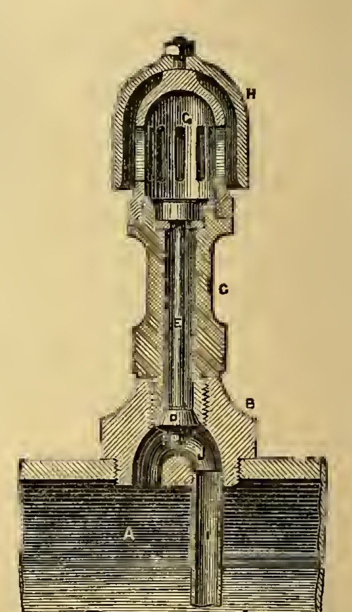


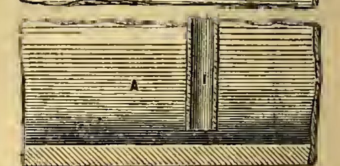
SAFETY VALVES.

JOHN HARVEY, *Bath.—Patent dated April* 21, 1860.

THE object of this invention is to prevent the explosion of steam-boilers, and relates to a peculiar construction and arrangement of safety apparatus; it is also applicable for bath and hot-water heating apparatus.

The annexed engraving represents the improved safety apparatus as applied to the boiler of an ordinary hot-water heating apparatus. A, is the body of the boiler, which is always kept full of water, and B is a gun-metal socket screwed into, or otherwise secured, to the upper part of the boiler. To this socket is screwed the safety pipe, C, into the bottom of which is fitted the conical safety fusible plug, D. This plug is held up to its seat by a long bolt, E, and nut, F. G, is a perforated cap screwed, or otherwise attached, to the top of the pipe, C; and over this cap is fitted a hood, H, for the purpose of preventing the dangerous spreading of the steam and hot water on the escape of the same. I, is a dip pipe leading from the socket, B, to the bottom of the boiler, and serving not only to aid the free circulation of the water in the boiler itself, from the top to the bottom, but also as a conductor of heat to the socket containing the fusible plug. In the case of an accidental obstruction occurring in the ordinary circulatory pipes, which would convert the boiler into a closed vessel, and so raise the temperature of the water to a dangerous extent, the air which is contained within the space, J, between the surface of the water and the fusible plug, will become sufficiently heated to melt the plug, and allow of the free escape of the steam from the boiler. A similar apparatus may be applied to a steam-boiler generator; and in this case the socket, B, containing the fusible plug, D, is wholly within the boiler, and just in contact with the water when at its proper level, so that the over-heating of the water would cause the fusible plug, D, to melt, and so allow the steam to escape up the safety pipe and out by the slots made in the cap on the top thereof.





RENDERING ARCHES AND OTHER STRUCTURES WATER-TIGHT.

JOHN PILKINGTON, *London.—Patent dated July* 25, 1860.

EVERY one is familiar with the annoyance and inconvenience which arises from the dripping of water from railway arches, in places where these structures cross the public streets. The inconvenience of wet and damp has, doubtless, interfered to a considerable extent with the occupation of railway arches as warehouses or workshops, and so forth. Mr. Pilkington's improvements appear well adapted to overcome the difficulty.

The patentee's invention relates to an improved system or mode of protecting and rendering water-tight brick and other arches or surfaces, and consists in coating or covering the said surfaces with heated bitumen or asphalte to about 3-8ths of an inch in thickness whilst in a heated state. The bitumen or asphalte is then covered with a material now commonly known as 'asphalted felt,' or with any other material or fabric of a similar nature, and over the surface of this felt or other material the patentee applies a coating of heated asphalte or bitumen of about 5-8ths of an inch in thickness. This invention is also equally applicable to roofs, floors, and all other surfaces which it is desired to make water-tight. In some instances, particularly where flat and even surfaces are to be operated upon, the materials referred to may be applied in a cold state—that is to say, manufactured in sheets or other forms, and afterwards laid down upon or affixed to the surface to be protected. The thickness of coating of asphalte or bitumen, or of the sheet or sheets of felt, may, of course, be varied as required to suit different situations or surfaces.

LAW REPORTS OF PATENT CASES.

Railways.—Prolongation: Adams and Richardson.—This was an application to the Judicial Committee of the Privy Council, before the Right Hon. Lord Cranworth, Lord Chelmsford, Lord Justice Knight Bruce, and Lord Justice Turner, by the trustees for the "Permanent Way Company," and by the original patentees, for a prolongation of letters patent granted on 4th of May, 1847, to Mr. W. Bridges Adams, and Mr. Robert Richardson for an invention of "certain improvements in the construction of railways, and of engines and carriages used thereon; and also in transport and store arrangements for the conveyance, management, and preservation of perishable articles." The letters patent were to endure for 14 years and the petitioners now prayed that the period should be extended for seven years after the expiry of that term. The improvements in the construction of railways had reference to the securing the joints, so as to prevent the tipping of the sleepers; to the connecting securely together different lengths of rails, so as to constitute each line of railway practically one continuous rail throughout the entire length of the whole line; to the arrangement of the rails at curves, so that long carriages and engines might pass more freely round very sharp curves, and the use of turn-tables be dispensed with. The petitioners stated that the improvements in the construction of the permanent way effected by the system of "fishing" the rails were of the greatest value and importance to the public, and had become essential for the security of travelling at high speed, and that the other improvements to which the invention related were of great value, and had contributed largely to the success of railways. It appeared that the "Permanent Way Company" was formed by a number of professional men connected with the construction of railways, for the purpose of introducing the most perfect system of constructing railways by a combination of the most recent modern improvements. The petitioners pleaded also that the term of the patent had not been sufficient for the introduction of the invention, and for adequate returns being received from it. According to a statement prepared from the books of the Permanent Way Company, by Messrs. Broom, Bagshaw, and Westcott, accountants, it appeared that the net profit on the patent had been £34,979 1s. 10d. The applicants estimated the saving in labour and materials by the use of the "fished" joint to be £75 per mile on a railway having an average traffic. The petition was opposed by the Great Northern Railway Company and by the North-Eastern Railway Company, on the grounds that the returns received from the invention were sufficient to remunerate the patentees; that the use of the invention, if at all retarded, had been retarded by the Permanent Way Company having introduced other inventions by which the same ends were attained. The objectors also alleged that at the time the letters patent were granted the invention was not new, and that the Permanent Way Company had not afforded proper and reasonable facilities for the general introduction and use of the invention, but by buying up and obtaining a monopoly of this and similar inventions the company had obtained large profits to the detriment of the general interest of the public and of railway companies.

Lord Cranworth (without calling on the opposing parties) stated that their Lordships, without entering into the merits of the invention, were of opinion that the remuneration already received under the patent now sought to be renewed was amply sufficient and that the petition should be dismissed with costs.

Mr. Knowles, Q.C., Mr. Grove, Q.C., Mr. Hindmarch, and Mr. Webster were for the petitioners; Mr. Bovill, Q.C., Mr. C. Pollock, and Mr. Horace Lloyd for the Great Northern and North-Eastern railway companies; and Mr. Welsby for the Attorney-General.

Smelting Ores.—Prolongation: Napier's Patent.—An application was made by the trustees of the English and Australian Copper Company for a prolongation of the letters patent, granted to Mr. Napier in March, 1847, for improvements in smelting copper and other ores. The privilege was to continue for 14 years. A company was formed for the purpose of applying Mr. Napier's method of smelting ores in Australia, and they now sought an extension of the period.

Their Lordships granted a prolongation of the patent for the period of five years.

Mr. Grove, Q.C., and Mr. Webster were for the petitioners, and Mr. Welshy was for the Crown.

Metal Foil: Horn *v.* Wimshurst's Patent Metal Foil and Sheet Metal Company (Limited).—This was a motion in the Vice-Chancellor's Court, before Vice-Chancellor Sir W. Page Wood, on behalf of a shareholder in the said company to restrain the directors from manufacturing and selling any sheet metal, capsules, or metal foils, according to the processes comprised in Betts's patent, and to restrain the directors from guaranteeing, on behalf of the company, purchasers of such articles against proceedings by Betts in respect of such purchases. The motion also sought to restrain the defendants from taking any proceedings against Betts for the purpose of impeaching the validity of his patent, and from applying any part of the assets of the company for that purpose, and from incurring any liability on behalf of the company with reference to any such proceedings. The company, in which the plaintiff was a holder of fifty shares, was formed in 1859 for the purpose of acquiring, holding, and exercising a patent invention for improvements in manufacturing sheet metal, of which Henry William Wimshurst was the sole patentee in England, and for other purposes in connection therewith, which were detailed in the memorandum of association of the company, hearing date the 4th of July, 1859. The bill stated that the plaintiff had recently discovered that the directors had commenced the manufacture of metal foils and capsules, according to the patented process of, and without any license or authority from, William Betts, whose patent for the manufacture of capsules (for bottle stoppers) out of a combined material of lead and tin has been the subject of continual litigation both at law and in equity. Mr. Betts had served notice upon the company calling on them to desist from infringing his patent. The directors, however, at a general meeting of the shareholders, were authorised to prosecute the manufacture of capsules and metal foils, and to grant guarantees against any proceedings by Betts to the purchasers, and also, if they saw fit, to take proceedings by *scire facias*, or otherwise, to obtain a repeal of Betts's patent. In consequence of these resolutions the plaintiff, who was not present at the meeting, had filed his bill, and now moved for an injunction.

Mr. Willock and Mr. W. Pearson appeared in support of the motion. Mr. Rolt and Mr. Haddan *contrà*.

The Vice-Chancellor said that the question was whether, having regard to the scope and objects of the company, the directors were at liberty to employ the funds intrusted to them in the manner contemplated. The objects of the company, as detailed in the articles of association, were the working, using, exercising, and vending Wimshurst's patent invention, obtaining improvements or additions to such invention, &c., and generally doing all such acts, &c., as might be necessary for the proper development of, or in any way incidental to, the carrying out all or any of such objects as aforesaid. It was not necessary in deciding the case to go a step beyond the proper development of Wimshurst's patent. The extent of that invention and its proper development must be guided by certain limits, but in the case of a trading company the Court must not be astute to discover such limits. On the contrary, the Court would rather strive to give the largest possible scope to the business. His Honour then proceeded to examine the evidence as to the proposed adaptation of the process to making capsules, and pressing and rolling the sheets of lead and tin, and held that these were not improper or extraordinary methods of applying and developing the patent. It was not necessary to lay down any broad principles as to the right of the company to take proceedings for repealing Betts's patent by *scire facias*. Thus much, however, was before him, that Mr. Betts would not be able to obtain an injunction in respect of his patent. The company, believing *bona fide* that Betts's patent was bad, might well think it worth their while to contest it. No doubt, the guarantee to purchasers went a step further, but the company might adopt it as a means of increasing their business, upon being told by their travellers that the inventions would have a good sale if purchasers were not frightened away by the threats of Mr. Betts. If the directors thought that they were being harassed by the claim of Betts, and that it would be to their interest to get rid of it, he could not say that any proceedings for that purpose would be against the scope and objects of the company. With respect to acquiescence and knowledge, he did not consider that the plaintiff stood in a very favourable position. But, quite independently of any considerations upon that point, he held that the company were doing that which was within their power, and with which this Court was not entitled to interfere. The motion must, therefore, be refused, with costs. Mr. Wimshurst's invention is described at page 8, vol. 4, second series of our journal

Railway Carriages: Lorkin *v.* the London and North-Western Railway Company.—The Vice-Chancellor, Sir W. Page Wood, gave judgment in this case, the bill being filed by the assignees of certain patents for improvements in railway carriages and waggons against the London and North-Western Railway Company, for the purpose of obtaining an account of the profits made by them from the use of the patents, and to restrain them from using any waggons, &c., to which such patent inventions have been applied.

His Honour, after stating at great length the circumstances of the case, which were very complicated, said that the plaintiffs were met by this formidable objection at the outset—that the account which was based upon the injunction could not be granted in a case where no injunction could have been obtained. Although the bill was misconceived, and for various reasons (to which his Honour adverted at length) could not but fail, still it was much to be regretted that the company should, in the first place, have attempted to depreciate the value of the patent of which they had had the use and benefit for a considerable period, and then disputed its validity. A great deal of useless expense had been occasioned by their conduct in the suit in going into evidence, &c., and, although the bill must be dismissed, it would be dismissed without costs.

Mr. Rolt, Mr. Freeling, and Mr. E R. Turner appeared for the plaintiffs; Sir H. Cairns, Mr. Willcock, Mr. Speed, and Mr. F. J. C. Millar for the defendants.

Iron Rails: Rae *v.* The Thames Iron Works and Shipbuilding Company.—This was an action before Lord Chief Justice Cockburn, and a special jury, and was brought for the infringement of a patent which the plaintiff had taken out for an improvement in the formation of the keel for iron steam vessels. The defendants pleaded "not guilty;" that it was not a first invention; that it was not new: that it was not the subject of a patent, &c. The plaintiff had been workman, foreman, and manager to Messrs. Rennie. The defendants' company having been established, they secured the services of the plaintiff. The defendants had contracted to build two ships for the Royal Mail Steam Navigation Company. The plaintiff was aware of a great defect in connecting the keelson with the keel in ships, and he had invented a mode of doing this, which he thought a great improvement. He had kept his plans and models sealed up in his own private office. Two persons connected with the Mail Company had come down to talk to him about the ships the defendants were building for them, and, in confidence, he showed them his models, telling them he should take out a patent. They highly approved the improvement, and requested plaintiff to apply it to their ships. Soon after this, on the 10th of April, 1858, the plaintiff took out a patent, and at the end of that month the directors and the plaintiff disagreed, and he left their service. After that time they applied his invention to the *Warrior* and other ships which they built, and refused to allow the plaintiff any royalty, and this gave rise to the present action.

For the defendants, it was urged that the plaintiff must be nonsuited, inasmuch as before he took out his patent he had communicated his invention, and had caused it to be used in two of the defendants' ships.

The Chief Justice said he should reserve the point whether it was not a privileged communication which had been made to the two persons who had been named.

Mr. Serjeant Shee contended that the plaintiff had communicated his invention to other persons, and had used it in the defendants' yard before he had taken out his patent; and, in addition to this, he had been in consultation with one of the defendants' foremen about the invention, and that each had suggested alterations; therefore, the invention was not new at the time the patent was taken out.

Witnesses were called with a view of showing that the groove for which the plaintiff had taken out his patent had been made, and its use known before the date of the patent. A specification sent in by the Royal Mail Steam Navigation Company was put in. It was dated in March, 1858; the drawing in that specification contained the groove. It was said to have been a matter of common discussion in the defendants' yard before that time. The object of cutting the groove was well known.

The Lord Chief Justice interposed, and asked if the jury believed the defendants' witnesses how could the plaintiff succeed. It was one of the hardships attending such things when a man told his invention; he always regretted that an inventor should so defeat his own interest.

The plaintiff was, therefore, nonsuited.

Mr. Bovill, Q.C., Mr. Hindmarsh, and Mr. Griffiths, were counsel for the plaintiff; and Mr. Serjeant Shee, Mr. Webster, and Mr. V. Harcourt, for the defendant.

Letter-press Printing. — Prolongation: Newton's Patent —This was a petition for a continuation of the privilege conferred by letters patent granted to Mr. Newton, of date 4th May, 1847, for an invention of "Improvements in machinery for letter-press printing;" being a communication from a foreigner residing abroad. The privilege granted was to subsist for 14 years. Several gentlemen gave evidence in support of the application.

Their Lordships granted a prolongation of the patent for five years.

Mr. Grove, Q.C., and Mr. Hindmarch were for the petitioner, and Mr. Welsby for the Crown.

British Economical Manure: Coveny *v.* Heigh.—In the Rolls Court, Mr. Graham Hastings moved in this case, *ex parte*, on behalf of the plaintiff, for an injunction to restrain the defendant from selling manure under the name of "economical" manure, or any other name which was a colourable imitation of the name "British Economical" manure, under which name the plaintiff sold his manure, and also from circulating prospectuses and testimonials which were copies of the prospectuses and testimonials belonging to the plaintiff, and used by him in his business.

His Honour the Master of the Rolls granted the injunction.

Copyright: Read *v.* Conquest.—This case came before Lord Chief Justice Erle, and Justices Williams and Keating, in the Court of Common Pleas, at Westminster, on demurrer. The action was brought by the plaintiff under the Copyright Acts, 3d William IV., chap. 15, and 5th and 6th Victoria, chap. 45, against the defendant, for infringing the plaintiff's copyright in a novel published by him, called *Never too Late to Mend*, which had been dramatised by the defendant, who is the proprietor of the Royal Grecian Theatre, in the City Road. Certain scenes and parts in the novel had been adapted for performance on the stage, and the plaintiff complained that this representation was an infringement of his copyright in the novel.

Mr. Lush, Q.C., appeared in support of the demurrer; and Mr. Corryton in support of the declaration.

For the defendant it was contended that the two statutes referred to, although they protected literary compositions and dramatic performances from being published or represented otherwise than by the author's permission, yet did not prevent or prohibit any person from dramatising a literary composition. Dramatising a literary composition was not multiplying copies of it and selling them, to the damage of the author; and the novel, until dramatised, was not a drama.

The Court took time to consider its judgment.

Fraudulent Trade Marks.—The Lord Chancellor has just introduced a bill in the House of Lords, for the prevention of fraudulent trade marks. It was, he showed, intended as a protection to the traders, not against competition but against fraud. The forging of trade marks not only injured the manufacturer in his profits but in his reputation, making him responsible for inferior articles. In other countries such forgery was a crime, but in this country could only be met by application to Chancery for an injunction—a remedy at once expensive and uncertain. By the present bill the forgery of trade marks would henceforth be a misdemeanour punishable by fine and imprisonment, and, would, he hoped, prove an effectual remedy for the evil. Further, it would enable us to obtain protection in France, where, in applications from this country, the uniform answer was that Frenchmen could get no protection here. The bill would likewise deal with the offence of affixing marks for goods falsifying their quality and quantity. Any mark placed on goods with an intent to deception would, by the bill, be a misdemeanour.

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REVIEWS OF NEW BOOKS.

TRANSACTIONS OF THE INSTITUTION OF NAVAL ARCHITECTS. Vol. I. Edited by E. J. Reed, M.I.N.A., Secretary to the Institution. 4to. Pp. 219. London.

WE have now before us the first instalment of the transactions of the Institution of Naval Architects in the shape of an elegant quarto volume, of upwards of 200 pages, containing in addition to the valuable papers read at the different meetings of the past year, a historical account of what may be called the birth and development of this institution; including the bye-laws and regulations of the society, and a list of the office-bearers, members, and associates. We find already no less than 345 names on this list, in which, however, the members and associates are given indiscriminately without any reference to their respective rank—an omission we hope to see remedied in the next volume. The meeting at which the Institution was established was held on the 16th of January, 1860, so that in point of age it is quite in its infancy, but judging from the results of the first year's labours, we should say it is an infant fast waxing strong. The first volume which we hope may prove the forerunner of many to come, contains the inaugural address delivered by Sir John Pakington, on the 1st of March, 1860, followed by an introductory address on the same day by the Earl of Hardwicke. We then have the first paper, "On the present state of the mathematical theory of naval architecture," by the Rev. J. Wooley, a name familiar to all naval architects, and our best authority on the theory of the science. Next follows a valuable paper by F. K. Barnes, Esq., being an "Account of experiments performed on board of some of Her Majesty's ships in 1855, 1856, and 1857, for the purpose of ascertaining the heights of their centres of gravity." This is succeeded by a brief paper on "An improvement in the form of ships," by Joseph Maudslay, Esq., C E., after which we have a paper by John Grantham, Esq., "On the strength of iron ships;" another paper with precisely the same title, read by W. Fairbairn, Esq., follows after, with the full discussions thereon, and on the previous paper by Mr. Grantham, the two forming a valuable and interesting contribution. The next paper is by the Astronomer-Royal, Prof. Airy, "On the connection between the mode of building iron ships and the ultimate corrections of their compasses," which contains some very useful suggestions Mr. White's "Diagonal system of shipbuilding," is next treated upon in a paper read by that gentleman, followed by "Investigations and observations with reference to the laws for the measurement of the tonnage of shipping," being a paper read by Samuel Read, Esq.; this is succeeded by a paper "On the new tonnage-law, as established in the merchant shipping act of 1854," by S. Moorsom, Esq. An interesting paper comes next, "On mechanical invention in its relation to the improvement of naval architecture," by N. Barnaby, Esq., in which the author gives a passing glance at the various naval constructions in vogue during successive periods of a hundred years, from the year 1260. A valuable contribution by G. W. Lenox, Esq , on "Chain cables," follows, succeeded by a paper "On various means and appliances for economising fuel in steam ships," by Robert Murray, Esq., C.E. The most valuable of the papers are, no doubt, the concluding two, which were read by J. Scott Russell, Esq., on "The wave-line principle of ship construction," in two parts. Part I. is devoted to the consideration of the principles of resistance, and to a form of least resistance, or that which will attain the greatest speed with a given resistance, whilst part II. treats of the nature of the motion produced in a mass of water when disturbed by the passage of a vessel through it. The talented author promises us a third paper, in which the effects produced by the wave line will be considered. These papers form a fitting termination to the volume, and ought to be prized by the profession, as they are, we believe, the only complete treatises on Mr. Scott Russell's theory. A table of the principal dimensions of fifty merchant steamers sailing from the ports of Southampton, Portsmouth, and Weymouth, is apppended, and such of the papers as require it are illustrated by plates, of which there are eleven, executed in Mr. Lowrie's best style.

The work is edited by Mr. E. J. Reed, the secretary to the institution, and does him infinite credit.

CHEESE MAKING MADE EASY. By Robert M'Adam, Dairyman, Gorsty Hill, near Crewe, Cheshire. 4to., pp. 45. London: Hamilton, Adams, & Co. 1860.

THE author of this very useful pamphlet is a Scottish dairyman, whose former sphere of operations was in Baldoon, Wigtonshire, well known as the centre of enlightened agricultural practice. On his transference to an English district he has very properly thought that he might judiciously employ his experience in explaining the "principles of the improved Cheddar method of cheese making, with remarks on various other methods of cheese making. What he now lays before us was originally written in competition for a prize offered by Mr. Bass, of Burton-on-Trent, and although the author did not succeed in his efforts in that direction, he has thought, and we agree with him, that his reflections on the subject might still be useful to the public. We may best explain his treatment of his subject by enumerating the several heads under which he has taken it. These are:—influence of the atmosphere on cheese making,—Cheddar system preferred,—milk house,—preparing the evening's meal of milk,—operations in the morning,—on the use of sour whey in cheese making,—description of process,—process when acid is too strong,—cheese room and ripening the cheese,—additional remarks,—answers to questions,—cheesemaking on Sabbath,—whey butter,—thermometer,—dairy,—cheese tub,—Annatto,—Rennet,—Curd breaker,—whey separator,—cooler or salting trough,—curd mill,—cheese vats and shape of the cheese,—weighing machine,—cheese press,—cheese bandages,—cheese room,—advantages of this system. To this matter is added an appendix treating of the Cheshire method of cheese making,—the Dunlop method,—the kind of cheese made in Derbyshire and Staffordshire—and the prize essay on cheese-making. In discussing all these points it will be seen that the author has gone very deeply into his subject—a most important one. It is our impression that cheese-making is comparatively little understood as a pure art, and Mr. M'Adam has also apparently been impressed with this view. He has done good service to the country in writing this pamphlet, for the whole art of cheese making, according to different modes, is most clearly laid down, and explained in lucid terms from the pen of a really practical man.

CORRESPONDENCE.

EXPANSION BY HEAT.

IN the last number of your Magazine there is a communication from Mr. Williams, of Liverpool, questioning the correctness of certain points advanced by me in my first paper, as they do not agree with a treatise which he has published on heat and steam. It appears from his letter that whoever differs in opinion from what he has written are to be looked upon as holding views "incompatible," "wholly unwarranted," "ingeniously and gratuitously raised," "erroneous popular theories," &c. This, to say the least of it, I think, is rather cool, and partakes rather of a freezing mixture than of heat, although I believe that the sensation of cold may induce heat.

Mr. Williams in his letter refers me and your readers to his treatise just published on "Heat." Would it not have been better if he had made his quotations from my paper shorter, and explained his own views more fully? The first notice I observed of Mr. Williams' work was a review of it in the *Engineer*, of October 12, 1860. That I read over with care, and certainly admired the generous style in which it was reviewed. I believe that any theory which has a tendency to induce inquiry is calculated to advance our knowledge of the principles which may be brought under consideration. His theories, however, so far as appeared to me, did not rest on fundamental principles, and therefore did not induce any particular desire on my part to read the work.

He observes:—"After experimenting on different metals, and 'finding the results similar in all, I inferred that the fluids would follow the same law. The fluids experimented on were mercury, oil, and water.' Now here was an inference wholly unwarranted. To compare a liquid formed of numerous separate particles or bodies in constant motion among themselves, and without any heat conducting power, as admitted by all chemists, with metallic bodies whose particles adhere so strongly as to prevent any motion *inter se*, and all of which have strong conducting properties, was surely unwarranted."

The first point to be considered is, are the laws of expansion and contraction the same in metals as in fluids—that is, do the metals and fluids expand when heat is applied. We know that they do; thus showing that the matter of which they are composed has undergone a physical change, and the amount is indicated by the pyrometer and hydrometer; and with these rudiments even the peasant is as conversant as the learned. The question of fluids Mr. Williams refuses to compare with metals, because they are formed of numerous separate particles in constant motion among themselves, and which he says are without any heat conducting power; now, can Mr. Williams conceive of motion without heat? If so, it is more than I can, as the physical laws clearly demonstrate this fact. It is by comparing things with one another that we are enabled to perceive with any degree of certainty, and by this process of analogy arrive at apparent facts; then what is the apparent difference between metals and fluids at a temperature of 30 degrees? They are both presented to us in the solid crystalline form—the one assuming the fluid form at a high temperature, the other at a low; and at a very low temperature mercury has been made to have the apparent solidity of lead, it becoming ductile, and when struck with a hammer having a ring similar to soft metals. We know if we mix equal quantities of *ice* at 32 degrees, and *water* at 172 degrees, the *ice* is instantly melted, and the temperature of the mixture is only 32 degrees; hence 140 degrees of heat have disappeared, and the whole has entered into the *ice*, which causes it to assume the fluid form. So much for popular theories.

It is well known that water is composed of hydrogen and oxygen, and it has been demonstrated that hydrogen conducts heat and electricity similar to metals; the great use of oxygen in combustion is too well known to require explanation.

Mr. Williams has quoted from one of my experiments with the mercury; and I am sorry to observe that he has selected the experiment which I made to verify the one preceding it, and on which I did not look as having that degree of correctness as the first, although the experiment occupied 3 hours, 45 minutes, which Mr. Williams seems to have overlooked. The experiment on which I depended was that made with the mercurial bar, but I infer this experiment would not suit his purpose quite so well.

On referring to the expansion and contraction of water, and after quoting from one of my experiments, Mr. Williams says:—

"The solution of the difficulty here so ingeniously and gratuitously raised is, however, so manifest, that it seems strange so accurate an observer should have overlooked it, and I have no doubt Mr. Cameron will himself smile on discovering his oversight. The cause of these changes is merely the expansion of the glass on being heated, and its contraction on being cooled. In the one case the glass, expanding, enlarges its capacity, and consequently, the water or mercury having to fall, the glass gives the appearance of falling in the thermometer stem, and the reverse on the glass being cooled, and of course contracted in its internal capacity."

Mr. Williams has no doubt but I shall smile in discovering my oversight. I have to inform him that it is now more than a quarter of a century since I was aware of the expansion and contraction of glass, so that I do not now remember whether I smiled or not; but this I may say, that I would not be inclined to place much reliance on the experiment as he describes it may be performed. I conceive the ordinary thermometer, being plunged into hot and cold water alternately, would indicate much more correctly than an instrument constructed in the manner described by him. I may mention here, that during the last ten years I have passed a very considerable number of high-ranged thermometers through my hands, and it was on perceiving the defects in the construction of their scales that I was led to examine this point more minutely. But let us look at Mr. Williams' solution of this point. He says, "The appearance is produced by the expansion and contraction of the glass." In 1683, Dr. Croune exhibited similar experiments to those of the Florentine philosophers, and concluded that water began to expand at a certain temperature above the freezing point. Dr. Hooke objected to this conclusion, and ascribed the apparent expansion of the water to the contraction of the glass in which the experiment was made. This induced them to cool the vessel in a freezing mixture, and then fill it with water, and the effect was the same as before. Mr. Williams will find that his theory bears a very close analogy to Dr. Hook's, published 1664—a work which contains the basis of many important discoveries. He formed an idea of a spirit or substance having the property of dissolving all combustibles when temperature is increased. There is also some analogy existing between this and Dr. Halley's theory of spontaneous evaporation.

But let us examine this question of expansion further. The expansion of glass from 32° to 212° equals $\frac{1}{1248}$—180° being the difference between 32° and 212°, then the expansion of glass would not be $\frac{1}{180000}$ parts—while the expansion of water is $\frac{1}{22}$. From this it is evident that the expansion of glass is only a conceivable fraction compared to that of water.

Heat has been the subject of controversy for some centuries. We can perceive its leading principles, and from these deduce laws, but its primary principles we cannot satisfactorily explain, in all their various forms, by any of the theories yet advanced. We may be told it is chemical action, but this does not explain the cause. We may be told that it is friction, but still we are without the cause—still the question is, What is heat? We cannot tell; but we can form an idea of what it is not.

In conclusion, I may observe that I have every respect for the writings of Dr. Dalton, but certainly give a preference to Professor Thomas Graham's papers on the physical energies of gases.

PAUL CAMERON.

Glasgow, February, 1861.

HOT-AIR ENGINEERING IN AMERICA.

I HAVE just discovered, in glancing over vol. i., new series, I think, an error of some magnitude, which I beg leave to correct. On page 198 [Nov. 1857] I say, in reference to the economy of fuel in the unsuccessful hot-air engines of the ship Ericsson, that "according to the best calculations which can be made on the performances, the engines actually developed a little more than two horse-power for each pound of coal burned per hour." I should have said a little more than *one-half* horse-power for each pound of coal burned per hour. The succeeding remarks, to the effect that this was "30 to 40 per cent. better than the majority of our most successful steamers," that it was "only rivalled by the very best stationary" apparatus, &c., probably convinced all familiar with engineering of what was intended, but it may be well to make this formal correction of the statement even at this day. The best steamers in this country perform with about three pounds per horse-power per hour, the best large stationary engines from two to three—reckoning in each instance the power within the cylinder as measured by indicator. Our largest and best pumping engines—those at Jersey City, Hartford, and Brooklyn—require about three and a third pounds per horse power per hour, reckoning the power by the "duty," or weight of water actually lifted, about 60,000,000 duty. The mammoth hot-air engines of the Ericsson required, according to elaborate deductions by the able professor of civil engineering at Yale College, only two pounds per horse-power per hour, reckoning the power actually utilised on the paddle-wheels. These engines, as has been before repeatedly set forth in your Journal, succeeded in saving fuel to a very important extent, but failed from practical difficulties which have so far proved insurmountable in large engines of such a character. While saving a few tons of coal, there were warped, cracked, abraded—and, in short, burned out as many tons of the engine itself. I may add, that the small hot-air engines of from one half, to one and a half, or two horse-power seem to be, in the main, a success, and to sustain in a good degree the hopes expressed for them in "American Notes" in 1857 and 1858. There are now about 600 small Ericsson engines in active operation of the style described at page 282, vol. ii., second series. Three or more machine-shops are commencing to manufacture the "Wilcox" engine, about equal in power to Ericsson's but very different in principle, and working more rapidly, with less noise, and it is hoped more durably. The later engines of the Ericsson style are, it should be remarked, far better constructed than the early ones, and are giving better satisfaction. Several have been built of sizes which should yield from five to ten horse-power; and a propeller of some 300 tons is now nearly completed, to be impelled by a horizontal double acting hot-air machine, devised and recently patented by the same indomitable Swede. The new style is, to carry a high pressure of air, or rather to work in an artificial atmosphere of some as yet unknown density, assumed to be 85 pounds per square inch. It is cooled by water in a tubular vessel, and heated in a pair of "heaters," both operations being conducted separately from the engine proper, like the production and condensation of steam in a condensing steamer. The boat is cheaply fitted up as a cattle transport, but the engines appear to be among the best specimens of workmanship ever produced in our city, and will, it may be presumed, test fairly, and far more cheaply than in the large passenger ship of 1853, the practicability of this motor for the purposes of navigation. She is an iron hull, and is named the *Primera*. I have not learned that a trial trip has been made, but it may be presumed that the engines have been worked at the dock, as a small engine (one of the common small Ericsson) was actively at work compressing air into the large reservoir several days ago. The following particulars, from the *Scientific American* of January 12, are probably official, and, although the pressure and consumption should be considered as prophetic rather than historical, it may be worthy of publication as pertaining to what will evidently be a very interesting experiment:—

"THE CALORIC PROPELLER 'PRIMERA.'

"The hull of this vessel was constructed by Messrs. Snecden & Co., of Greenpoint, L. I. Her owners are Messrs. Pesant Brothers & Co., of this city, and the route of her intended service is the coast of the island of Cuba. As the introduction of Captain Ericsson's hot-air engine into this vessel is regarded as perfectly successful, we give the annexed details of her hull and machinery. Length between perpendiculars, 135 feet; extreme length on spar deck, 144 feet; breadth of beam, 22 feet; breadth over guards, 34 feet; depth of hold, 9 feet; draft of water at load line, 6 feet 3 inches; displacement of vessel at load line, 10,800 pounds to the inch; tonnage, 330 tons. Her frames are of angle iron $3 \times 3 \times \frac{3}{8}$ inches, spaced 18 inches from centre to centre, every alternate frame having a vertical floor-plate, 9 inches deep and 5-16ths of an inch wide, securely riveted thereto. There are five fore-and-aft keelsons, viz.—one centre, 12 inches deep; two sister, 10 inches deep; and two bilge, which are 8 inches in depth. These keelsons are made of iron 5-16ths of an inch in thickness, and are thoroughly fastened to the shell of the vessel, and strengthened on their top edges by bars of angle-iron $3\frac{1}{2} \times 3\frac{1}{2} \times$ 7-16 inches. The deck beams are of angle-iron $6 \times \frac{1}{2}$ inches, and are riveted to the head of every alternate frame; they are also secured by plate-iron knees, $\frac{1}{4}$ of an inch in thickness at each end, and have scantling beams attached, extending out 6 feet beyond the hull, forming a guard all around the vessel; the ends of the above beams are flanged, and receive a stringer-iron $6 \times \frac{3}{8}$ inches around their extremities. The guards are diagonally braced with iron rods fastened to the deck-beams and to the sides of the vessel. There is a stringer-plate 15 inches wide and 5-16ths of an inch in thickness, extending entirely around the hull, and fastened to every deck-beam and also to the shell of the vessel, by a bar of angle-iron 3 × 3 × ⅜ inches. The plating is of various thicknesses, as follows:—thickness of keel, 9-16ths of an inch; do. of garboard streak, ⅝ inch; do. from garboard streak to turn of bilge, 5-16ths of an inch; do. of wale streaks, ⅜ inch; the rivets in her keel are ⅞ inch diameter, and those in the plating are ⅝ inch in diameter. The *Primera* is fitted with a double-acting, condensing, pressure, caloric engine (Ericsson's patent); diameter of cylinders, 40 inches; length of stroke of piston, 24 inches; diameter of propeller, 8 feet; pitch, 16 feet; length of same, 19 inches; length of blades, 30 inches; weight of the engine, propeller, &c., 70,000 pounds; length of engine in the vessel, 14 feet; length of engine-room, 8 feet. She is also supplied with two heaters, which keep the pressure of air at 85 pounds per square inch; the consumption of coal (anthracite) per hour is 85 pounds; the heaters are located in the hold. In addition to these essential features, she has two smoke-pipes, independent rudder-post, and two athwart-ships watertight bulkheads made of ¼ and 3-16ths of an inch iron; the whole is vertically stiffened by bars of angle iron 2½ × 2½ × 5-16ths inches, placed 3 feet apart. Said bulkheads are perforated with suitable holes, which are provided with valves to shut watertight. Her rig is that of a schooner. The machinery was constructed by Mr. C. H. Delamater, of New York."

I will endeavour to inform you of the result.

New York, Feb., 1861. T. D. Stetson.

ROTATION OF BODIES ON THEIR AXES.

As it is not my intention to fill your valuable space with vain repetitions, I beg to refer any one so disposed to fig. 1, in my letter of Dec. 1859. It will there be seen that the ball or moon, D, rotates upon a horizontal axis, but at the same time maintains its relative position in revolving round the ball or earth, E, as it would do under any other circumstance. The ball, D, rotates *palpably* and *visibly* upon "its own *horizontal* axis." Will any one for a moment hold so contradictory an opinion as to assert that the ball, D, can rotate upon a vertical and horizontal axis (that is, upon two axes at right angles to each other) at one and the same time? If not, the *apparent* or *deceptive* motion must be the result *alone* of the revolution round the axis of the ball or earth, E. This discussion now rests at my challenge. What has become of "Sir John's" champion?

Cheltenham, February, 1861. Bertram Mitford.

FRAUDULENT TRADE MARKS.

I very much fear that the manufacturers of this country are not aware of the great extent to which our trade marks are forged and stamped on goods for which England is so justly celebrated. And not only are the goods stamped exactly as we stamp them, but our labels are so closely imitated that it is almost impossible even for an experienced person to detect that they are false and fraudulent imitations.

We find that the Continental manufacturers, without the least scruple, stamp our exact names and trade marks on their productions, thereby deceiving the consumer and injuring the reputations of English manufacturers in various branches of trade.

I have just been sent for to the Custom-house for my opinion on some goods just landed *via* Ostend, and what do I find? A large importation of files, scissors, needles, and black-lead pencils, all stamped in full with the names of our most celebrated makers; in the case of Brookman and Langdon's pencils, the labels actually caution the purchasers to be particular and see that they get the real makers' goods; in the scissors, not only is Rodgers and Sons' name stamped on, but also their corporate mark (which, by the Act of the Cutlers' Company of Sheffield, is punishable by summary conviction before a magistrate). In fact, it is barefaced fraud, and robbery of the good name of the British manufacturers; and it is high time that our Government interfered to put a stop to it.

In this case the goods will be destroyed; but I would have the agent here punished for lending himself to such dishonourable transactions.

We must have some protection from having our good reputation stolen from us by these Continental manufacturers, for none of us know how much we suffer by these stabs in the dark, and from which we have no power to protect ourselves.

London Bridge, Feb., 1861. A Cutler.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

January 22, 1861.

"On the rise and fall of the river Wandle: its springs, tributaries, and pollution", by Mr. Frederick Braithwaite, M. Inst. C.E.

This history was compiled from a survey of the river Wandle, made early in the spring of the year 1853, from its rise at Carshalton, and at Croydon, 111 feet 2 inches and 123 feet 10 inches respectively above Trinity high water mark (T.H.W.M.), to its outfall in the Thames, at Wandsworth. In the course of the survey, special notes were taken of the several springs, tributaries, and sewerage from drains, which swelled the amount of the water. The levels of the successive falls of the river from its spring-heads, through the numerous mills, were carefully taken; also, a complete set of gaugings of the water from the numerous springs and tributaries. The general character of the water was brilliant and pure, with the exception of that from the paper mills, and where the road drainage was discharged into the river, after heavy rains. The water contained about 16° of hardness, and a small quantity of sulphate of lime. The different mills situated on the main stream were noticed, giving a statement of their power, height above T.H.W.M., in many cases the quantity of water used at each, and other details. The operations carried on at some of these works, such as rinsing silk goods, washing skins, &c., and the chemicals employed, which when used were discharged into the river, tended materially to contaminate the stream. Indeed, it was generally remarked, that the water below all the print works were much coloured when any print washing was going on. The colour did not appear to settle, it only became largely diffused. The water used for cleaning the blocks was also sent into the river. In clear weather, the contrast between the water at the Carshalton springs and that at Merton bridge was very marked; proving to the sight alone, how unfit the water had become for drinking purposes, during its progress through so many works, discharging impurities, and over such a soil, and receiving such drainage. In dry seasons this would be still more striking. There were twenty-five mills on the main stream, using 545 H.P.

February 5, 1861.

The discussion upon Mr. Braithwaite's paper "On the river Wandle; its springs, tributaries, and pollution," was continued.

February 12, 1861.

"On the river Wandle; its springs, tributaries, and pollution," renewed discussion.

ROYAL INSTITUTION.

February 1, 1861.

"On the study of the English language, as an essential part of a University course," by the Rev. A. J. D. D'Orsey, B.D.

INSTITUTION OF ENGINEERS IN SCOTLAND.

December 26, 1860.

"Notes on Stirling's Air Engine," by Mr. Patrick Stirling.

The subject of this paper may require some apology for being introduced at this time; but at a recent meeting of this institution there was one of Mr. Ericsson's air engines exhibited and explained, without any account of its performance as to power, consumpt of fuel, &c., being given; and it has been considered that a description and statement of the performance of Stirling's air engine might be interesting to members of the institution. The engine forming the subject of this paper was constructed by Mr. James Stirling, at the Dundee Foundry, in 1842, for the purpose of driving the machinery there, and was erected in room of the steam engine, by removing the boiler, cylinder, air-pump, and condenser, and making use of as many of the parts of the steam engine as could be made available, which will account for the apparent want of arrangement of the different parts of the engine. In this engine there were two strong air-tight vessels, connected by passages with the opposite ends of the working cylinder, in which last was a piston of the ordinary construction used in the steam engine. The lower ends of the air vessels were kept at a high temperature by a furnace which was common to both, and the upper ends of the vessels were kept from accumulating heat by a series of water pipes, through which there was a constant flow of water. In each of these vessels there was an air-tight vessel or plunger filled with a non-conducting substance, such as pounded bricks, to prevent the radiation of heat. These plungers were slung to the opposite ends of a lever, and were capable of being moved up and down in the interior of the air vessels, and their use was to shift a body of air from the hot ends of the vessels to the cold ends alternately, and in such a manner that the quantity in one would be at the hot end whilst that in the other was at the cold end.

If we consider, then, that the movements of the air engine depend upon the well-known principle in pneumatics that air has its bulk or pressure increased when it is heated, and decreased when it is cooled, there will not be much difficulty in understanding that the movement of the plungers up and down will cause a pressure to be exerted on the opposite sides of the piston alternately; and upon the difference of pressure obtained on the opposite sides of the piston depends the power of the engine. It may be mentioned that the plungers were moved by an eccentric or crank on the crank shaft of the engine, in the same way as the slide valve of a steam engine, and at nearly the same angle to the crank.

This engine was made to work on the high-pressure principle, as it was found that engines working at the simple atmospheric pressure gave so little power in proportion to their size as to render them unfit for practical use. It was found necessary, therefore, to apply a double-acting air pump for the purpose of increasing the density of air in the air vessels, and the usual minimum pressure was ten atmospheres, which, on being thrown to the hot end of the air vessels, was converted into a pressure of fifteen and a half atmospheres by the addition of heat. The difference, then, in the pressure of the air when hot and cold constituted the disposable pressure upon the piston for the purpose of producing power. When the pump had got up the full working pressure in the engine, the air, instead of being blown off, was allowed to pass into an air-tight magazine, where a sufficient quantity was kept over night to fill the engine up to full pressure at starting in the morning, and this done, the suction valves of the pumps were nearly closed altogether, the leakage of the engine being so small that scarcely any addition of air was necessary.

Having explained the principles of the air engine, and by what means power was obtained from two opposing volumes of air, it will be necessary to consider the means by which economy in fuel was effected, as it must be evident to the most casual observer, that, were the whole heat that was necessary in making one stroke, taken from the hot end of the air vessel, and thrown away at the cold end, the power produced by its expansion and contraction would be more expensive than that which is gained by the use of steam. To obviate this waste of heat, Dr. Robert Stirling discovered that the air could be divested of its heat to a great extent, on its passage from the hot to the cold end of the air vessels, by dividing the air into a multitude of thin films by means of strips of thin sheet iron kept apart from each other, and presenting a great metallic surface for receiving the heat. Now, as every body by contact will give out heat to one that is colder than itself, the air, when it enters the narrow passages, must give out a portion of its heat even at the hottest end of the passages, and must continue to give out more and more heat in its progress upwards, as the temperature of the passages diminish, until it ultimately escapes into the cold end of the vessel where there is only a small portion of heat to be extracted to reduce it to the required temperature. Thus, the temperature of the air at the hot end may be 600°, and when it arrives at the cold end it may be down to 150°, so that the whole heat constituting the difference of these two temperatures must have been left in the sheets of iron forming the narrow passages; and this being the case, there is no room to doubt that the cold air, when again made to enter the narrow passages, for the purpose of being heated, immediately comes in contact with metal that is hotter than itself, and consequently has its temperature increased by so many degrees every inch it travels downwards, until, on its arrival at the hot end, it requires but a comparatively small addition to its temperature to complete the necessary pressure to move the piston. The thin sheets radiate from the centre of the air vessel, and fill up the space between it and the plunger. In this may be said to lie the grand principle of the air engine; and when it was applied to highly compressed air, it produced a large amount of work for the fuel consumed.

The engine under consideration had a working cylinder of 16 inches in diameter, with a stroke of 4 feet, and when tested with a friction brake it was found capable of sustaining a weight of 1,250,000 lbs. raised 1 foot per minute; or 37 horses power for a whole day, on a consumption of 1000 lbs. of Scotch Chew coals, including the quantity necessary to get up the heat in the morning. This gives a consumption of 2·7 lbs. per H.P. per hour, but when the engine was not fully burdened, the consumption was considerably under 2·5 lbs. per H.P. per hour. This was considered a very fair result to be obtained eighteen years ago; and it is not unreasonable to suppose that had the construction of engines of this kind been persevered in, still greater economy in fuel would have resulted. The engine drove the works at the Dundee Foundry for several years at a very small cost for maintenance.

The whole interior of the machine being entirely free from dust and moisture, there was little or no tear and wear of the different parts, and the piston, and piston and plunger rods, did not consume a gill of oil in a week.

The principal cause of the failure of the air engine was the difficulty experienced in getting the heat to pass through the lower ends of the air vessels with sufficient rapidity to supply the place of the heat that was carried away by the water pipes or refrigerator at each stroke: and in order to compensate for the slowness of the conducting power of the metal, which was necessarily pretty thick, it was necessary to keep the outside of the vessel at a very high temperature, which induced irregular expansion and contraction and incipient decay, resulting in the cracking of the metal and consequent destruction of the vessels. Notwithstanding this defect, the writer is of opinion that small engines upon this principle could be constructed and used with economy in situations where the use of steam is impracticable from want of room to erect steam boilers, or from other causes. There would be less smoke emitted from the chimney; there would be no noise as with a steam boiler blowing off, or a high pressure engine exhausting; and accidents from explosion would be entirely avoided, as, when the air vessels did give way, a very small opening made its appearance, which allowed the air to escape in a few seconds without doing the slightest injury.

In answer to various questions, Mr. Stirling said the healing vessels were four feet internally in diameter, and on every side there were minute air passages formed by metal plates, arranged not quite 1-32 of an inch apart. The plungers fitted as closely as they could make them, but there was no packing except about the piston and plunger rods. The packing of the plunger rods was peculiar. There was a copper tube filled with a solution of pitch and oil, fixed to the top of the plunger, and into this there dipped a pipe attached to the stuffing box, whilst a leather collar above encircles the rod, so that by no amount of pressure could any air get through. He had not heard of any air engine since this one was made, which had been so successful as it. This engine could be made to work at 10, 15, or even 20 horses power, with every satisfaction. For such powers the air vessels were not so large, but that they could make their bottoms comparatively thin. If these vessels were efficiently constructed, and with their bottoms thin—for example, not thicker than the upper parts of the vessel's sides—the success of the engine would be complete. There was no practical difficulty, except in getting air vessels to withstand the heat. So far as the piston and cylinder were concerned, he had never seen better working machinery. The piston has worked for years without alteration, and it was observed that the sides of the cylinder were polished like mirrors. The piston packing was a pair of common cast-iron rings, such as in ordinary steam engines, and made self-springing. The piston rod was packed with a leather like that of the heating vessel, and exactly like the plunger of a Bramah press. These leathers would work for three or four months. The temperature of the cylinder varied between 120° and 150°. He could not say exactly what was the highest temperature of the air vessels, but the bottoms were kept red hot. The temperature in the cylinder was almost constant, and also in the tops of the air vessels, where it never rose above 150°, but it was not so easily measured at the bottom. It had been assumed, however, that it was 600°. In the practical working of the engine the plates in the side passages of the air vessel took up heat from any body hotter than itself, passing over it, which heat it gave out again in the reverse process. The air entered at 150°, got heated during its descent by coming in contact with gradually hotter portions of the plates, and so by the time it got near the bottom of the vessel, it had become heated to nearly 600°. The great difference between this engine and Ericsson's was this:—The engine of Mr. Ericsson, on board the steamer which attracted so much attention, was a low pressure one, and it took in fresh air at every stroke, and as quickly threw it away. The blowing of the air through wire gauze was the first thing tried by his father to obtain economy, and for which a patent was taken out in 1816 The air vessel no doubt might be made of copper, but it would not be so strong; and there was another objection, if it became red hot, it might stretch or get out of shape. No doubt platinum would be the best metal to make it of. He could not arrive at the first cost of an air engine as compared with that of a steam engine; but of course there were no boilers nor slide valves required in the air engine. Diagrams of the engine had been taken, but they could not be depended upon as absolutely perfect, from the fact that there was a great deal of friction with the indicator piston, which required to be very tight on account of the great pressure. They never got a very truthful figure on account of the friction, but the diagram was a good one so far as it went. The engine described had worked for four years, and in that time they had to renew the air vessels once. It took very little water to keep the top part of the engine cool. They allowed it to run down into a cistern, where it cooled, and was then used over again. The temperature of the water rose to 150° or 160° on passing through the refrigerating coils.

Professor Macquorn Rankine said that one very great advantage Stirling's engine had over Ericsson's—although they were generally much the same in principle—was that the latter took in a fresh supply of air at every stroke, so that the air had to be taken into the engine at the atmospheric pressure. This gave a very small effective pressure in pounds upon the square inch, so that for a given power it was necessary to have very large engines. Hence, though the engines of the ship *Ericsson* were economical, they were of so vast a size, and took up so great a proportion of the capacity of the ship, that there was little room left for cargo. They propelled the ship at only seven miles an hour and had they been capable of driving it at double that speed, they would have left no room for anything else. The advantage of Stirling's engine was that it worked with compressed air, which was used over and over again. By that device they were enabled to use air compressed to, say, twelve or twenty-four atmospheres if they wished—indeed, there was no limit except the strength of the metal; and thus a large amount of work was done by a machine occupying a small space. The air engine of Mr. Stirling was even more compact than the ordinary steam engine. He agreed with a member that this was the best air engine that had been put in operation, and he thought it was a pity that it had been laid aside. Perhaps if the use of it had been persevered in, improvements might have been devised through practical experience. An attempt was made by Mr. J. R. Napier and himself to improve upon this engine, by giving the air vessels a larger heating surface. They formed the bottom of the vessel into a number of cylindrical tubes with hemispherical ends, and having a number of plungers of the same figure working in them. They made a pair of those heaters, and found them very rapid in conveying heat to the air. Air being a much worse conductor than dry steam, and very much worse than moist steam, of course it followed that a greater surface was required for the purpose of communicating a given quantity of heat to a mass of air, than either to steam or water. Mr. Napier and he, succeeded in communicating heat rapidly to the air, but they never got the length of testing the efficiency of their engine, as unfortunately circumstances came in the way to prevent them. It seemed to him, however, that it would have been worth while to persevere in this device for increasing the heating surface, which was the only improvement they proposed to introduce. The engine was to have been similar in other respects to Mr. Stirling's, which they considered the best existing air engine.

Mr. Young said, with reference to the expansion of air, he recollected that when he was attending to these matters the law was stated to be, that, if they took air at 32° it doubled its bulk by the additional heating of 480°; but Regnault had shown, a few years ago, that air at 32° had its bulk doubled by the addition of 493°; so that when they added one degree to the air, it became $\frac{1}{493}$ more under all pressures. Now, it appeared to him, with regard to the air engine, that the best way would be to work it at a very high pressure. Suppose they used air at a pressure of 20 atmospheres to begin with, and supposing they were heating it the half of 493°, it would be 247°, and by adding that heat they made two volumes of air into three, that is, they would get 10 atmospheres in reality, and get it by only 247° of change of temperature. He thought metals could be got to last a long time at that temperature. The air would be then of about 310° at its maximum, and he supposed the metals would stand pretty well up to 400°. He thought that would be a likely way of getting great power. There was little doubt, in his mind that the air engine was the real instrument, and he had often wondered it had not come into use; and, from what he had heard that night, he had great hopes for it. It got quit of the great loss in the steam engine—the latent heat.

Mr. Stirling said they always found the engine worked the better the higher the pressure was raised. It unfortunately happened, however, that when they came to increase the pressure, they largely increased the difficulty of making good joints and good tight castings. If they increased the pressure, the ordinary fitting joints would permit air to blow out. They had great difficulty in making them tight up to 10 and 20 atmospheres, and even supposing they got over that difficulty then the piston-rod packing might get troublesome. These were the difficulties they had to contend with—and also the probability of perhaps the bottom of the air vessel dropping off. There was no danger of explosion. He had been present on two occasions when the air vessel cracked, but the only inconvenience he felt was getting a little black smoke thrown in his face. The air all escaped in about two seconds. It occurred in the vessels with bottle-shaped bottoms. The vessels used were made of cast-iron, with a little copper in it, which greatly increased their strength.

January 23, 1861.

The adjourned discussion on railway curves was resumed, and communications were read from Mr. William Gravatt, F.R.S., respecting the application of the curve of lines, from Mr. Froude, and Mr. William Bell.

"On pumps," by Mr. George Simpson.

"On the ventilation of mines," by Mr. George Simpson.

Instead of testing the air of the mine in the laboratory as is now done, the author of the paper proposes to use a gas indicator, the mere inspection of which at once tells the quality of the air, or the amount of hydrogen mixed with it; for if this admixture of hydrogen reaches 7 per cent. the air becomes explosive. This apparatus comprises a closed chamber, with inlet and outlet pipes, for the mixed gases to enter from the mine. In this chamber there is a delicate balance, to one end of which is suspended a light sphere of considerable size, which displaces a given quantity of the gases. To the other end of the balance is suspended a hydrometer, immersed in water contained in a vessel. The sphere and hydrometer are adjusted to exactly balance each other when the chamber is filled with atmospheric air, at a known temperature, and the index must then point to zero. Then if the chamber is filled with air from the mine, and this air contains hydrogen, the weight displaced by the sphere will be proportionately lessened, and the sphere will consequently descend until balanced by the portion of the hydrometer thereby raised out of the water. In this way the position of the balance will indicate the specific gravity of the mixture of gases, which in the cases of gases taken from mines is tantamount to indicating the amount of hydrogen present, and consequently the more or less near approach to an explosive condition.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

January 21, 1861.

"On the kaloscope," by Mr. Heys, of Hazel Grove, his newly invented instrument for the use of coloured light in the examination of objects under the microscope. This the author effects by two sets of four discs, each of differently coloured glass 2½ inches in diameter, mounted on a stand 12 inches high, one set of which is placed between the light and the bull's eye condenser, and the other between the light and the mirror, underneath the stage, each disc having an independent motion, so that the light can be transmitted through one or more of both sets at the same time; when the object appears of the colours refracted and reflected through the discs. One of the important uses of the instrument is the protection of the eye from injury occasioned by the use of common artificial light. Many objects which do not polarise, by the kaloscope are made to disclose the beauties of polarised light; for instance, the anthers of the mallow, with their pollen, when viewed by means of red light below the stage, and at the same time green light (the complementary colour) through the condenser, appear of a beautiful green colour on a red or crimson ground. The author observes that some objects, viewed by means of the kaloscope, appear in such relief that they might be supposed to be seen through a stereoscope; these are anthers, jointed hairs, oil-glands, and vegetable sections in general. The calyx of the moss-rose is alluded to, under ordinary illumination, as a mere entanglement of fibres with dark beads; but by this method it is transformed into a stereoscopic branch, with glittering glands at its extremities. Sections of wood, spines of echini, &c., will be found as beautiful as with the polariscope; but, by another arrangement, details are brought out not observable with the latter instrument. A black surface being placed below the stage, coloured light is thrown very obliquely from the mirror, and the complementary colour through the condenser; hairs on the edges of leaves, petals, and filiments of stamens, &c., then appear illuminated by the light of the condenser of one colour, and fringed with the opposite colour on an intensely black ground. The author gives a list of the botanical names of objects advantageously illuminated by this method. A single coloured disc may be also used to advantage with white light from the bull's eye lens. Details of structure are observable by means of this instrument, which the author observed are inconspicuous without its aid, and thinks that its efficacy in connection with such a variety of purposes, cannot fail to render it of value to the scientific observer.

The Secretary read a paper "On preparing objects found in soundings," and described Mr. Dale's process for disposing of the tallow by means of highly rectified benzole, which is most effectual. The benzole (called benzine by French chemists), being recovered, to be used again as fast as required for a dozen filters, each with its specimen in process at the same time, with only trifling loss from evaporation.

January 31, 1861.

"Abstract of meterological observations taken at the Royal Engineers' Observatory, Gibraltar, during the year 1860," by Mr. Mosley.

Mr. Baxendell communicated a table of the fall of rain at the Flosh, Cleater, near Whitehaven, during the last three years, drawn up from observations made by Thomas Ainsworth, Esq.

Mr. Baxendell, referring to a letter by Dr. Wolf, of Zurich, inserted in No. 1289 of the *Astronomische Nachrichten*, on the variations in the frequency of the solar spots, exhibited a diagram showing such frequency by the relative lengths of ordinates laid off from a line representing the time. Treating Dr.

Wolf's data by the method of least squares, Mr. Baxendall had deduced a mean period of 11·086 years, the mean epoch of minimum frequency being 1732·96.

"On meteorological observations, and observations of the temperature of the Atlantic Ocean, made on runs from Liverpool to Gibraltar, and from Gibraltar to Liverpool, in September, 1860," by Mr. T. Heelis.

In the course of a discussion which ensued on the red colour of the sky, often observed as an indication of approaching bad weather, Mr. Binney mentioned that Mr. Dancer had shown him an aurora borealis of a pale greenish white colour, which, when observed through glass upon which moisture had been deposited, appeared red.

Mr. Baxendell mentioned that several fogs, especially those which had occurred in the early part of the present winter, had been observed by him to be luminous, and that Mr. Crosse, the electrician, had found many fogs to be highly electrical.

February 5, 1861.

Mr. John Curtis communicated his observations of the fall of rain in the years 1860, 1859, and 1858, and compared them with Dr. Dalton's average for 47 years, and with the mean of the last 72 and 75 years. The following is a summary of the results:—

Average from 1794 to 1860	35·46	inches.
,, from 1786 to 1857	36·398	,,
,, from 1786 to 1860	36·274	,,
Dalton's from 1794 to 1840	35·523	,,
In 1858	30·53	,,
,, 1859	33·09	,,
,, 1860	36·24	,,

Comparing the last year with 1859 it was found that

The number of rainy days	in 1860	were	28 days above that	in 1859.
The amount of evaporation	,,	was	0·92 inches below	,,
The mean temperature	,,	was	3·13 degrees below	,,
The highest temperature in shade	,,	was	9·6 degrees below	,,
The lowest temperature in shade	,,	was	19·9 degrees below	,,
The lowest temperature in sun	,,	was	6·0 degrees below	,,
The lowest temperature on grass	,,	was	19·9 degrees below	,,
The mean of barometer	,,	was	0·031 inches below	,,
The number of days of snow	,,	were	8 more than	,,

Dr. Crace Calvert stated that in consequence of having found lead in snuff packed in leaden cases, he had examined tea, chicory, &c., but without discovering lead in them, which he attributed to the protection afforded, in some instances, by the interposition of paper between the article and the leaden case, and in others to the absence of sufficient moisture to promote chemical action.

One of the medals struck on the occasion of the coronation of the present King and Queen of Sweden, presented to the Society by the University of Christiana, excited much admiration on account of the excellence of medallurgy it displayed.

SOUTH WALES INSTITUTE OF ENGINEERS.

Discussion on Mr. Pearce's paper "On a simple form of diagram for showing the motion of the valves in steam engines."

"On the large proportion of coal lost in working it," by Mr. Basset.

"On the cornish engine," by Mr. Sims.

"On the iron ores of Northampton," by Mr. Brown.

FRENCH ACADEMY OF SCIENCES.

M. Boutigny read a paper on the temperature of water when in a spheroidal state—that is, when transformed into steam or vapour. M. de Luca having on a previous occasion announced that the iodide of starch, when in a spheroidal state, did not lose its colour, and that consequently its temperature would not exceed 80 or perhaps not 50 degrees centigrade, and M. Boutigny having remarked quite a contrary effect, the latter was induced to examine what could be the cause of such a wide difference in the results of the same experiments, and he has found it in the quantity of iodine and in the duration of the experiment. When the iodide of starch contains 1-200th part of iodine, it may be brought to the point of ebullition without being discoloured. In that case, however, he considers the temperature to be 96½ degrees. MM. Schatzenberger and Paraf sent in a communication on luteinline, the colouring matter of wood. This substance, first extracted by M. Chevreul, had not yet been analyzed, owing probably to the difficulty of procuring it in sufficient quantities by M. Chevreul's method. The authors of the paper in question have therefore invented a new mode of preparation. The wood is first exausted by alcohol, the solution thus obtained is precipitated by water, and the precipitate is then heated in water raised to a temperature of 250 deg. centigrade (two and a-half times that of boiling water) in a cylinder of cast steel, closed by a steel screw. After the liquid has cooled, the inner surface of the cylinder is found covered with yellow crystals in the form of needles, and at the bottom there is a button of resinous matter. These crystals, when purified and analyzed, yield 625 of carbon, 38 of hydrogen, and 337 of oxygen per cent. Messrs. Joly and Musset sent in further researches on spontaneous generation, a theory which they support. Their paper contains a description of certain new experiments of their own, from which it appears that whatever precautions may be used to destroy the germs said to float in the air, by heating it, and making it pass through concentrated sulphuric acid, and no matter how long the organized substances experimented upon may have been exposed to ebullition, still the vessels in which the operations have been conducted will be found to contain organized productions which cannot have been introduced by atmospheric air.

ASSOCIATION OF FOREMEN ENGINEERS.

FEBRUARY 2, 1861.

"On the resistaoce offered by cast-iron to internal pressure," by Mr. John Briggs. The author considered cast-iron to be the most deceptive of all metals, for in addition to its liability to unsoundness in the process of casting, and fracture from unequal expansion, it was affected injuriously from a variety of other causes. Pig-iron was iron in its most impure state, for it was contaminated by all the impurities which were capable of combining with it in its primitive form as ore, and which chemical affinity prevented its parting with in the process of smelting. Frequently, indeed, it was found that the same charge yielded iron of totally different qualities. It had occurred to the reader of the paper that some of the impurities which thus interfered with the character of cast-iron were actually other metals, and modern chemistry supported the theory. Many mineral productions, which were formerly considered simple substances, had been proved to have metallic bases, from which had been obtained metals; for example—aluminium, barytum, magnesium, calcium, and silicum. Then again manganese, which abounded in the Bowling and Low Moor irons, and which gave them their superiority for solidity and strength, and caused them to be largely used in the manufacture of heavy guns might be mentioned. There were several other elements, such as carbon, sulphur, and phosphorous, which more or less affected the character of cast-iron. The first-named give fluidity and softness to the iron, while sulpher and phosphorous were the greatest enemies he had to contend against. These were the primary points which those who employed cast-iron in the construction of cylinders intended to resist great internal pressure—whether in the shape of pieces of ordnance or of hydraulic presses—had to deal with, and perhaps no one had laboured more zealously to comprehend and explain them, than had one of their own members, Mr. Keyte, who employed at Woolwich Arsenal. The existence of the various substances and elements he (Mr. Briggs) had named, was doubtless due to the peculiarities of the localities in which the ore was obtained. In addition, however, he must be permitted to say, that the constitution of cast-iron was materially affected by the manner of smelting it. It was necessary to exercise great care in this operation, and in making proper selections of different kinds of iron for particular purposes. The judgment of the ironfounder must be largely relied on in this case and it was well when that judgment was not at fault. There was a limit to the pressure which should be put internally to cast-iron, and there was a limit also to the thickness of metal to be used for the cylinders of hydraulic presses. Such a statement, might at the first blush appear to be irrational. The general opinion would undoubtedly be that the thicker the iron the greater its resistance to pressure where the bore remained the same size. This he believed not to be the case, and Mr. Joseph Bramah had held long ago the same opinion. At the time that one of the press cylinders employed in raising the tubes of the Britannia Bridge had burst asunder, a workman once in the employment of Messrs. Bramah thus wrote to a scientific publication:—"At Bramah's we never found presses in constant work stand more than three tons (6720 lbs.) on the square inch, and the greatest pains were taken to obtain the most approved kinds of iron—mixed qualities—to cast the cylinders from. I have seen press cylinders stand seven thousand and even eight thousand pounds on the square inch under proof for a short time; but we never could trust them to work with so much, and cast-iron then was far superior to that of the present day. Increasing the thickness of the metal in press cylinders was seldom successful. I have known metal seven inches thick stand as well as that of $10\frac{1}{2}$ inches, for presses with rams 10 inches diameter. The thicker the metal the greater appeared to be the difficulty in getting it equal and homogeneous throughout." The writer of the foregoing had assisted in the construction of upwards of 100 hydraulic presses at Bramah's, and his remarks came with all the weight, therefore, of authority based on experience. For himself, he must say that his own experience, though more limited in extent, confirmed him in a like opinion. He, indeed, almost thought that the error at present consisted in making such cylinders too thick. If the metal were used thinner, there would be more certainty of obtaining castings of greater density and uniformity, and therefore better calculated to sustain pressure. Mr. Briggs next adduced some instances of fractured cylinders, and referred to a list which he had, in a former paper, laid before the meeting. Experiment and experience, then, alike induced him to believe that there should be a limit to the thickness of all cylinders intended to resist high pressures.

MONTHLY NOTES.

MARINE MEMORANDA.

A screw-steamer of 2,500 tons, register has been launched by Messrs. W. Denny and Brothers for the Montreal Ocean Steam Navigation Company. The vessel, which has been named the *Hibernian* is the first of two additional steamers which Messrs. Denny are building for the Company's Canadian trade, and is the ninth which they have constructed for the line. The *Hibernian* is to be fitted with engines of 400 horse power. The erection of some public memorial is contemplated in honour of the late Mr. John Wood, the father of the trade. Mr. J. Ferguson, in a paper just read before the Scottish Shipbuilders' Association on river steamers, expressed an opinion that while they had attained a high position as regards speed they were inferior in accommodation to the steamers of America. Mr. Ferguson advocates the introduction of deck saloons, for the shelter of deck passengers.

The experimental firing from the 80 pounder Whitworth gun at Portsmouth has been recently brought to an abrupt termination by the discovery of a flaw or rent in the metal at the breach. The gun, which weighs four tons, has been landed from the Stork gunboat, packed, and conveyed to the railway station to be forwarded to Woolwich. Many naval officers experienced in gunnery are of opinion that the principle of the gun in working metal upon metal is radically wrong. They argue that if any foreign substance is introduced into the bore of the gun, such as a cinder from the funnel, and should get between the inner surface of the gun and the projectile, the latter would infallibly jam, and the gun would burst.

It having been in contemplation for some time past by the Lords of the Admiralty to supersede, in a great measure, the employment of horses in Her Majesty's dockyards by the use of Bray's steam-traction engines, some important improvements have been suggested in their manufacture, which are now being carried out in the construction of an engine on the improved system, to replace the one delivered by the company for the permanent service of the dockyard at Woolwich. The power of the new engine will be greater than that of the former ones, the area of the cylinders being nearly double. The framing will also differ, and will be somewhat similar to that of a railway locomotive, and an outside bearing is provided, which will considerably strengthen the wheels and prevent their laminating. The engines will be mounted on springs and the boiler suspended on trunnions to ensure its being on a level in ascending and descending uneven ground, and the steam will be superheated to prevent priming. The engines on the old principle have been engaged for some days past in removing the *Warrior's* engines and machinery from Messrs. Penn's factory at Greenwich, and, notwithstanding the extremely varied state of the weather and the roads, they have succeeded admirably.

The *Philomel*, 5, screw gun-vessel, Commander Leveson Wildman, steamed out of Portsmouth harbour on the morning of the 7th ultimo, to Stokes-bay, for the purpose of testing her speed at the measured mile, before proceeding on service on the west coast of Africa, where she will be employed in the suppression of the slave trade. The average of the runs made at the mile gave the ship a speed in knots of 9.540, using a Griffiths propeller, at a draught of water of 12 feet 5 inches aft, and 10 feet 9 inches forward. On her trial at light draught, prior to her commission—drawing 11 feet 5 inches aft, and 7 feet 1 inch forward, using the Admiralty, or common screw, with its leading corners off—she attained a speed of 10.851 knots. The diameter and pitch of the screw being in both cases nearly the same, the Griffiths used on the present trial being 9 feet diameter, with a pitch of 12 feet 6 inches, and the Admiralty screw used on the trial at light draught differing only from the Griffiths in having 2 inches less pitch. The *Torch*, a sister vessel to the *Philomel*, on her deep draught trial made 8.843, the draughts of water being about equal. The *Ranger*, also a sister vessel, on her deep draught trial, drawing $4\frac{1}{2}$ inches less than the *Philomel*, made 8.981 knots. It will be seen, therefore, that the *Philomel's* trial has been a very successful one, and bids fair for her success in her future career as a "slave liberator."

According to the latest documents published the naval forces of Denmark are composed of 40 sail of the line (20 sailing vessels and 20 steamers) and 70 smaller vessels. Their strength is as follows:—Sailing vessels—4 sail of the line (2 of 84 guns and 2 of 72), 312 guns; 6 frigates (1 of 60 and 5 of 44 30-pounders), 280 guns; 4 corvettes of 28, 20, 14, and 11 guns, 73 guns; 3 brigs of 16 and 12 guns (18-pounders), 44 guns; 2 schooners of 1 large swivel gun each, 2 guns.; 1 cutter, with 6 small swivels, 6 guns; total, 717 guns. Steam vessels (12 afloat and 8 building),—1 screw of 70 30-pounders, building, 70 guns; 2 screw frigates of 40 guns each, 80 guns; 2 screw frigates, building, (1 of 52 and 1 of 42), 94 guns.; 2 screw corvettes (12 and 10,30-pounders), 22 guns; 1 screw corvette, 16 guns, building, 16 guns; 2 screw gunboats, 2 guns each, 4 guns; 4 screw gunboats, building, 4 guns.; 5 paddle-wheel steamers, mounting together 24 guns (60, 30, 24, and 18-pounders), 24 guns; 1 Royal paddle-wheel yacht of 12 3-pounders, for the use of His Majesty, 12 guns—total, 326 guns; flotilla of row boats, 85 in number, mounting together 140 guns of different calibre, 140 guns—general total, 1,183 guns. In addition to the vessels above-mentioned the Danish navy has nine steam transports, four of which are building and will be completed this year. The *personnel* of the navy comprises 1 vice-admiral, 3 rear-admirals, 31 captains, 23 captain lieutenants, and 80 lieutenants.

The total number of passengers arriving at Boulogne, embarking from or for British ports, in the course of the year 1860, amounted to 102,830, taking the arrivals and departures together. In 1859 there had been a total of 86,582 passengers. The increase on the preceding year was thus 16,248 passengers, or $18\frac{1}{2}$ per cent. The commercial treaty is beginning to exercise a marked influence on the trade of Boulogne, and there has been a considerable increase in the arrival of vessels laden with coal and iron from British ports during the last few months. The quay room of the harbour is fully occupied; but the new western quays, which will present greatly increased facilities for the discharge of colliers, are rapidly progressing, and will be completed by the autumn of the present year (1861). The works of the floating dock are also advancing, although momentarily retarded by the inclemency of the season. The herring fishery has been very productive during the season, up to the 31st of December last. The fish landed at Boulogne by the 113 boats engaged in it had so far been sold for 2,536,139f. (£103,446), being an excess of 684,476f. (£27,379), when compared with the corresponding period of the preceding season. In 1859-60 47,917 barrels of salt fish were prepared at Boulogne. In the present season it is thought the total will exceed 55,000 barrels. The new bathing establishment, estimated to cost £20,000, is to be contracted for on the 12th of February. The past year has altogether been one of prosperity at Boulogne, both as a trading town and a bathing place, and has been extremely healthy throughout, notwithstanding the nearly uninterrupted continuance of wet weather.

The National Life-boat Institution sent recently one of its best single-banked life-boats, accompanied with a transporting carriage, to Penarth, on the Glamorganshire coast, where during the last two or three years some dreadful shipwrecks, with loss of life, have occured. The boat is 30 feet long, 7 feet wide, and rows six oars; she will self-right if upset, and immediately self-eject any seas she may ship. The transporting carriage of the boat is well adapted to its purpose. By an ingenious contrivance the boat, with her crew on board, is launched off the carriage. The hauling-up of the life-boat on her carriage is accomplished with equal facility. The cost (£180) of the life-boat and her equipments is the benevolent gift of Mr. George Gay, of Bristol. A commodious and substantial house has been built for the reception of the life-boat, her valuable stores, and carriage. In fact, there is probably not a more complete life-boat establishment on the whole Welsh coast than is now found at Penarth. A free conveyance was, as usual, readily given to the life-boat and carriage by the Great Western and South Wales Railway companies over their lines. Arrangements will forthwith be made by the local committee for the organization of a crew and for the appointment of an efficient coxswain for the boat, who will have the charge of her, and who will, every time she is required, go afloat in her. Mr. J. B. Bryan, of the Coastguard at Penarth, has been indefatigable in his exertions to obtain public support in aid of the cost of the boat-house, which cannot be much less than £130. Lady Windsor, the Marquis of Bute, and other persons have also rendered substantial assistance to the Penarth life-boat establishment. The National Life-boat Institution has now 108 life-boats in connection with it. Of these, 12 are stationed on the shores of the British Channel—viz., St. Ives, New Quay, Padstow, Bude Haven, Appledore (two boats), Braunton, Penarth, Porthcawl, Llanelly, Carmarthen-bay, and Tenby. Many of the Bristol Channel life-boats of the institution have already been the means of saving a large number of lives from wrecked vessels, and also many ships and valuable cargoes from destruction.

Immense Graving Docks for Birkenhead.—At the weekly meeting of the Mersey Dock and Harbour Board, held on Friday, it was resolved to construct a very large graving dock at Birkenhead. Its length is to be 750 feet, its width 85 feet, and its depth 100 feet. It is to be large enough to accomodate two rows of ships, and to be so constructed as to admit two ships at a time. Its cost is estimated at £84,000.

Marine Ventilation.—When we reflect that a single human being requires a supply of 330 cubic feet of air in the 24 hours, and that the action of the lungs renders 60 feet of this quantity absolutely poisonous and unfit for breathing, we see at once the vital importance of due attention being paid to the subject of ventilation on board ship, and more particularly when vessels are crowded with emigrants or troops. The difficulty of supplying the interior of ships and the stoke-rooms of steam vessels has been solved in a most satisfactory manner by Messrs. Schiele and Williams, whose admirable marine ventilator we here engrave. Fig. 1 represents a perspective elevation of the ventilator or blast engine; and fig. 2 is a corresponding elevation of the turbine steam-engine and fan removed from the machine. The casing of the machine is of a rectangular figure at the lower part, and arched at the top. At one end is arranged a circular chamber, in which is fitted the turbine steam-engine, which consists of a wheel or runner of brass, with curved grooves cut in its face, forming a sort of wings or buckets; encircling this runner is a cylindrical steam-chamber, also of brass, with small apertures in its inner face, through which the steam enters on the middle of the wheel's surface, equally all round its circumference. The steam enters the steam chamber by the laterally projecting pipe, shown in front of fig. 1. After communicating its power to the runner by impinging on the wings or grooves in the same manner as water acts in a turbine water-wheel, the steam passes out on each side to the exhaust steam-pipe, shown at the end of the casing. As the steam-pressure acts equally all round on the runner, there is no strain whatever on the bearings, which have therefore merely to support the comparatively trifling weight of the shaft. The rapid rotatory motion of the turbine engine is imparted to the double fan, arranged on the same shaft, as shown in fig. 2. These fans are on M. Schiele's patent silent principle. The mode of application is to have tubes or air trunks carried from the ventilator through the holds, cabins, &c. These tubes have openings in them, so arranged that, by means of slides or valves, fresh air can be thrown into any portion of the cabins or holds, and the whole of the ship or any portion of it can be ventilated at pleasure. In this way all parts of the vessel may be thoroughly cleared of impure air; and in the case of steam-ships, an abundant and unfailing supply of air is supplied for the draught of the furnaces. At the same time, a large body of cool air being impelled through the stoke-room, the stokers are enabled to attend to their duty with a degree of comfort undreamed of under the old system. The engraving represents the machine as manufactured by the North Moor Foundry Company, Oldham. It takes up very little room, a ventilator (engine and fan complete) discharging 600,000 cubic feet of air per hour, being only 3 feet long, 2 feet 9 inches broad, and 3 feet high. In ventilating the steam troop ship *Indus*—which is constructed to carry 2000 troops—upon this system, the induction air is drawn from the paddle-boxes, and so charged with moisture, which is very necessary in India. At the trial trip, the weather being very cold, the machines drew the hot air from the space above the boilers, and the cabins were thus made very comfortable.

Fig. 1.

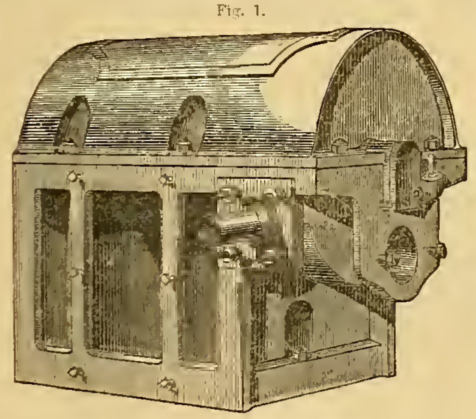
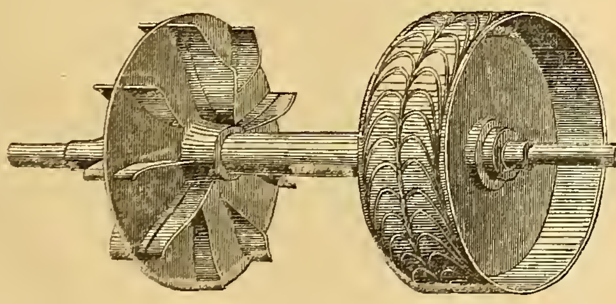


Fig. 2.



Death of Mr. Macgregor Laird.—We regret to announce the death, since the issue of our last, of Mr. Macgregor Laird, so well known in connection with African exploration. At an early age Mr. Laird relinquished his interest in the extensive engineering establishment in Liverpool, and was associated with Richard Lander in conducting the first steam expedition up the river Niger, with a view to open up the commerce of the interior. After undergoing great hardships, he returned to England in 1852, with the few of his companions who had survived the effects of the climate. He next turned his attention to Transatlantic steam navigation, and by his abilities and enterprise materially contributed to the accomplishment of that great object; subsequently he for a short time devoted his energies in furtherance of the great works in progress at Birkenhead. During the last twelve years of his life Mr. Laird devoted his attention exclusively to those objects in which his heart had lain from early youth—the development of the trade and civilization of Africa, having for many years advocated this as the only means of finally extinguishing the slave trade. With these views he obtained a contract from the Government, and established the African Steamship Company, which maintains a monthly communication with the coast, and in 1854 he fitted out a trading and exploring expedition at his own expense, but with Government support—the result of which was, that the steamer *Pleiad* penetrated 150 miles beyond the furthest point that had previously been navigated; and so admirable were the arrangements, that this expedition was distinguished from all those which preceded it by the fact that not a single death occurred. Encouraged by this result, and with the assistance of Her Majesty's Government, as well as that of some gentlemen who sympathised in his philanthropic exertions, Mr. Laird fitted out another steam expedition on a still more extensive scale, opened up communications with the interior, and established trading depots, which still exist. Unfortunately for the cause of African civilization, he has been cut off in the midst of these avocations, though it is to be hoped that others will profit by the experience afforded by his operations, and follow in the path opened up by his enterprise.

Saving the Crews of Stranded Vessels.—A series of exceedingly interesting experiments, having for their object the providing a certain means of communication between stranded vessels and the shore as a means of preserving the lives of their crews at a time when communication by boat would be impossible, were recently brought to a close at Portsmouth in a most satisfactory manner. The trials have extended over a period of some months, and the means proposed to be employed have been tested in every possible way by the gentleman who has suggested—in fact, carried it out at his own expense, Lieutenant G. S. Nares, senior lieutenant of Her Majesty's ship *Brittania*, Captain Robert Harris, the naval cadet training ship in Portsmouth Harbour. Lieutenant Nares employs the common kite principle as his chief agent; but while he sends his kite away to leeward, and consequently towards the shore, he retains the means on board the stranded vessel of bringing down the kite when flown sufficiently beyond the beach, or over the cliff. So that the line attached to the kite may be hauled upon by the people on shore, and the end on board the vessel being attached to a hawser, and the latter on reaching the shore being hauled up the cliff, a means of escape to the crew and passengers, however numerous they may be, so long as the vessel holds together, or however violent may be the surf which intervenes between the ship and the land, is open to all with the most perfect safety by a boatswain's cradle, basket, or slung cask being attached to the hawser, and hauled backwards and forwards by the people of the vessel and those on shore. To bring the kite to the ground when sufficiently advanced beyond the face of a cliff, or high-water mark, Lieutenant Nares has a second line attached to the right angle of the kite; holding on to this line, and letting go the flying line of the kite, the latter instantly capsizes and descends to the earth. This mode is applicable to the rescue of the crew of a vessel which has been driven well on shore, but is in a position either from the surf or the formation of the coast, in which no vessel can approach her. Another mode in which this life-kite may be used is where it may be able to effect a landing on a beach to leeward, but the boats are washed overboard or stove, or the position in which the vessel may lie on a bed of rocks may render boats useless. In this case the flying line of the kite is attached by a toggle to the bunghole of a cask, to a couple of baskets with a boat's mast lashed athwart them, or round a man's chest, with the knot between his shoulders; in either case the kite is the supporting power, and conveys the object its line is fast to on shore, another line being attached to the cask, raft, or man from the vessel, and the communication with the shore is complete. The particular credit due to Lieutenant Nares consists in having, by his second line, devised a means of bringing a kite to the ground at the moment required, and in also making use of the kite in attaching its flying line to an object in the water, a carrier of his hawser's hauling-line to the people on the shore. Kites have been tried before, but have failed for the want of these two great requisites. A few years since a vessel drove on shore on the Devon coast, close under the land. The captain sent up a kite, which flew over the people's heads on the shore, but they had no means of reaching it, and the whole of the unfortunate crew perished in sight of the people on shore, who were there ready to aid them could the line from the kite overhead have reached their hands. A short time back, the brig Mercy, of Bristol, was wrecked at Porthleven, in Mount's Bay. A tremendous surf was running, but to save the crew it was necessary to form some communication otherwise than by boat. A cask was thrown overboard among the breakers, with a small line attached, and was, after great difficulty and risk of life on the part of the people on shore, got hold of, and a hawser hauled on shore, to which a swung basket was attached, and the crew were saved. In this case the kite would have conveyed the cask to the people on the beach without their having to risk their lives by running into the breakers and surf to lay hold of it. The concluding experiments by Mr. Nares were made from Her Majesty's steamer *Bulfinch*, Lieutenant James. The *Bulfinch* on this occasion was 600 yards from the shore, and the experiments answered perfectly. Lieutenant Nares has presented his plan to the Shipwrecked Fishermen's Society, and also the 50 guineas which had been awarded him.

Steam Shipbuilding on the Clyde.—Messrs. Napier and Sons, of Govan, are building a fine new steamer, to be named the *Scotia*, and intended for the Cunard line of Atlantic steamers. The *Scotia* will, next to the *Great Eastern*, be the largest mercantile steamer built. Messrs Napier have also entered into a contract to build an iron-cased war steamer, intermediate in size between the *Warrior* and the *Resistance*. The contract has been taken at £41 10s. per ton, as compared with £37 per ton in the case of the *Black Prince*, and £31 10s. per ton in the case of the *Warrior*. Messrs. Napier's tender is, however, 10s. per ton lower than a similar one entered into by Messrs. Westwood, Baillie, Campbell, & Co., of Millwall, Poplar. The new batteries (which are intended for blockships), instead of being limited, as regards their iron casing, to a length of 214 feet amidships on each side, will be plated entirely round from below the water line upwards. The Scottish Shipbuilders' Association has had a discussion on Lloyd's rules on iron ships, and a local committee of shipowners and shipbuilders has been formed with a view to assist the central committee in London in revising whatever is objectionable or defective in the regulations.

Bankruptcies in the United States.—The number of failures in the United States has been steadily decreasing since 1857, which, it will be remembered, was a year of severe commercial depression. Last year the total was 3,676, as compared with 3,913 in 1859, 4225 in 1858, and 4,937 in 1857. The liabilities represented by these figures amounted to 79,807,845 dols. last year, 64,294,000 dols. in 1859, 95,749,662 dols. in 1858, and 291,750,000 dols. in 1857.

Mineral Tanning.—It has been recently proposed by a Mr. Friedel, to employ persulphate of iron, in tanning hides and skins, at the same time adding to the liquid a metallic oxide, which, without decomposing the salt of iron, will take up the acid as fast as it is exposed. This substance may be alumina, oxide of manganese, or oxide of zinc. In other respects the process is carried on in the usual manner.

Straw Paper in Canada.—The manufacture of paper from straw is now being carried on at Toronto. It can be sold at fourpence per pound. The patent consists in the application of nitric acid, or the aqua fortis of commerce, to straw or other vegetable fabric, in combinatien with other substances, of which alkalies will naturally play a part. It is by the repeated action of nitric acid, diluted with certain proportions of water and caustic soda, or soda ash, that the fibre of the straw undergoes the necessary modifications and is rendered available for the required purpose. If this mode of manufacture succeeds commercially and we see no reason why it should not, the result will be a great boon to the printers, and publishers.

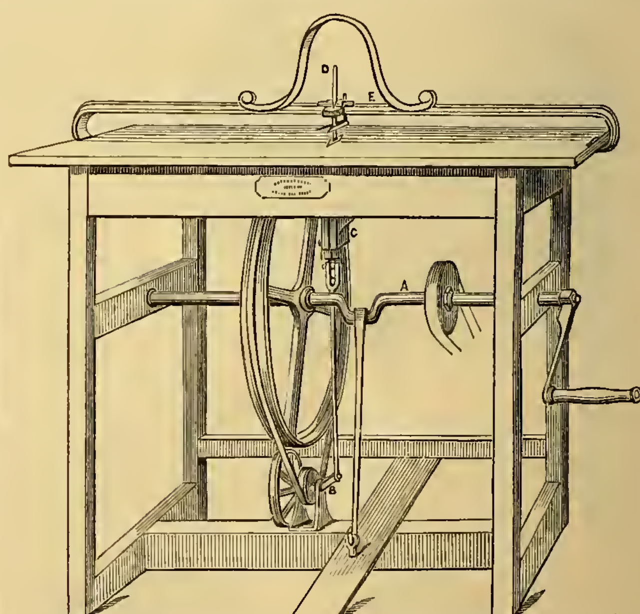
Oxalic Acid as a Preventive of Certain Reactions.—M. F. Pisana has added some further facts to what we know about the property which oxalic acid possesses of preventing certain reactions by its presence. Thus he shows that if an excess of oxalate of ammonia be added to a neutral salt of iron, and then acetic acid, the yellow colour of the solution will not be changed into red, as it should be, owing to the formation of acetate of iron. Again, in the same solution, phosphate of soda will not precipitate any phosphate of iron, nor will the nitrate of uranium be precipitated by the cyanoferruret of potassium, if oxalate of ammonia be added to the solution.

Winter Temperature.—The following returns of the greatest cold in various parts of England in December last have been printed by the Registrar-General, and may doubtless be relied upon:—Helston, 18.0; Truro, 11.0; Torquay, 22.0; Ventnor, 22.0; Osborne, 18.9; Worthing, 17.9; Fairlight, 20.0; Hurstpierpoint, 3.0; Clifton, 7.1; Gloucester, 1.0; Pembroke, 18.5; Lampeter (Cardigan), 0.6; Greenwich Observatory, 8.0; Guildhall, 14.5; Regent's Park (York-terrace), 10.9; Camden-town, 6.7; Leyton (Essex), 1.3; Oxford, 0.0; Aspley, 13.5; Bedford, 6.0; Cardington, 3.6; Diss (Norfolk), 3.0; Derby, 2.0; Nottingham, 8.0; Liverpool Observatory, 16.2; Manchester, 3.0; Leeds, 3.0; Harrogate, 9.5; Scarborough, 16.0; St. Paul's, Silloth, 1.5; North Shields, 6.8; Alnwick, 12.0. In the extreme north of England the cold was not so severe as it was south of Yorkshire.

Warming Railway Carriages by the Waste Steam of Locomotives.—Some of the engineers on the French railways have recently introduced a plan of warming railway carriages, which should be at once adopted in England, involving as it does only a trifling expense, and being a great boon to travellers. The waste steam from the engine, instead of being allowed to escape into the air, is conducted from the escape pipe of the engine, by means of a vulcanised India-rubber tube, to copper pipes, through which it circulates under the seats and flooring of the carriages. As soon as the train is set in motion, the steam commences to circulate through all the systems of pipes and warms the carriages, first, second, and third class equally; and being connected with each other by India-ruber tubing, they can be immediately attached or reunited at pleasure. In a trial on the Lyons line, two thermometers placed in first-class carriages marked 60 degrees Fahrenheit during the whole journey, and in the second and third class carriages the temperature was sufficiently elevated to allow of the longest winter's journey being accomplished without discomfort. However cold the carriages may be when at rest, as soon as the train is started the steam commences to circulate through the tubing, and communicates an agreeable temperature to the whole train. This, we should fancy, will prove a most excellent and economical mode of warming. But it must be borne in mind that it must be paid for in the shape of loss of power from the back pressure on the piston, arising from the retardation of the passage of the escape steam by traversing through the pipes.

New Acid from Oxydised Nitro-Benzine.—MM. Clœtz and Guignet have recently discovered a new acid which they have obtained by oxydising nitro-benzine. It is prepared from benzine by means of nitric acid, and is remarkable for a fine smell of bitter almonds, in consequence of which it is used to perfume soap with. If boiled with a solution of permanganate of potash, or else with a mixture of nitric acid and bichromate of potash, nitro-benzine absorbs oxygen, and is transformed into an acid, which is solid and soluble in nitro-benzine, with the aid of heat, whence, on cooling, it is deposited in white crystals. It has no colour, but a hot and bitter taste; it melts at a temperature not more than a common one in summer, and is volatilised without a residue, when it will crystallise again in brilliant and flexible needles. It is not very soluble in cold, but considerably so in warm water, also in alcohol and ether.

Cutting Out Machine.—An ingeniously arranged machine for cutting out garments has been devised and patented by Mr. J. E. Betts, of Northampton. The subjoined engraving represents a perspective view of the apparatus complete. The machine consists of a wooden framing; the upper part of this frame forms a table on which the goods to be cut are placed. The uprights of the frame have cross rails fitted to them, which carry a horizontal crank shaft, A; on this shaft is fitted a driving pulley, the belt from which gives motion to a small pulley arranged beneath, and carried on a longitudinal rail of the frame. The spindle of the smaller pulley is furnished with a crank, C, which, by means of a link, gives motion to a vertical knife, D, working out through an aperture made for that purpose in the table. The upper portion of the knife passes through a guide, E, which is supported by a light horizontal bar extending across the table so as to leave its area quite free for the operator to move the goods about in any



required direction. The crank, or driving shaft, may be driven by means of a treadle, or by a winch handle, or by a pulley and belt actuated from any convenient prime mover. When the main shaft is put in motion, it imparts a rapid reciprocatory movement to the knife, D, so that when the edge of the fabric or material to be cut is presented thereto, it is rapidly cut through—the line of cutting being varied just according to the direction in which the operator moves the material. The cutting action being similar to a vertical saw, from one to fifty thicknesses of fabric may be cut through at once. It is obvious that with this machine a vast amount of work may be got through in a very short time. For army contractors, clothiers, staymakers, and others who cut out large quantities of goods, it supplies a desideratum the absence of which has been long felt.

International Copyright.—A convention with Sardinia, signed on the 30th of November, and of which the ratifications were exchanged on the 4th of January, has been laid before Parliament. It provides for an international copyright in works of literature or art published in either country—terms which are to comprise publications of books, of dramatic works, of musical compositions, of drawing, of painting, of sculpture, of engraving, of lithography, and of any other works whatever of literature and of the fine arts. Besides original works, a translator is to be protected in respect of his own translation. The author of a work is to have for five years the exclusive right of translation, if exercised within a certain period. These stipulations are to apply also to the representation of dramatic works and the performance of musical compositions; but fair imitations or adaptations of dramatic works to the stage of the respective countries are not prohibited, but only piratical translations. Articles from newspapers or periodicals may be republished or translated in the newspapers or periodicals of the other country, provided the source is acknowledged, unless (the article not being one of political discussion) the author in a conspicuous manner forbids the republication. Each country retains its right to prohibit by measures of legislation or police the circulation or exhibition of any work it may deem it expedient so to prohibit.

Scottish Commerce.—The shipments of pig iron last week amounted to 7,748 tons. In the corresponding week of last year the total was 6,171 tons. In the month just closed the shipments were 39,836 tons as compared with 41,147 tons in January, 1860. A proposition is afloat to reduce the number of furnaces in blast. The Customs revenue received at the Clyde ports during January exhibits a satisfactory increase at all points. The receipts at Glasgow were £70,464 last month, as compared with £61,930 in January, 1860, and £58,532 in January, 1859. At Greenock the totals were £59,738, £55,584, and £62,257, respectively; and at Port Glasgow, £9,809, £1,095, and £7,462, respectively. With regard to the Dundee linen trade, it is stated that a fair amount of orders are in course of execution for the home, West Indian, and other markets, but only a comparatively small quantity of goods is being sent to the United States. Production at Dundee is being curtailed, both in spinning and weaving. Mr. M'Leod reports of the wool trade that consumers are only buying what they absolutely require. Prices remain firm, and stocks are gradually becoming lighter.

The Manchester Association for the Prevention of Steam Boiler Explosions.—At the monthly meeting of the executive committee, held on Tuesday the 29th ult., Mr. L. E. Fletcher, C. E., chief engineer, presented his report, from which the following are extracts:—We have made 92 visits, and examined 199 boilers and 165 engines. Of these visits, three have been special. Of these boilers, 2 have been specially, 159 externally, 6 internally, and 32 thoroughly examined. Eight cylinders have been indicated at ordinary visits. The principal defects met with during the month are as follows:—Fracture, 4 (1 dangerous), corrosion, 15 (2 dangerous); safety-valves out of order, 5 (1 dangerous); water gauges out of order, 4; pressure gauges ditto, 4; blow-off cocks ditto, 6 (2 dangerous); fusible plugs, 4; furnaces out of shape, 1 (dangerous); over pressure, 1. Total, 44 (7 dangerous). Boilers without water gauges, 3; blow-off cocks, 15; feed check valves. 8. The chief engineer in his report, which is too long for insertion *in extenso*, remarked that two boilers had been inspected during the last month, which, although working at a pressure of 10lb. yet were not fitted with their own independent safety valves, but had to rely for the escape of their steam upon the safety valves of some adjoining boilers, the communication to which could be intercepted, and the arrangement was consequently pregnant with danger. Attention was called in the report to the too frequently disregarded weakening effect of steam domes upon the shells of boilers, reference by way of illustration being made to an explosion which took place lately to a boiler, not under the inspection of this association, which, though of good material and workmanship, went right through the opening for the steam dome, the dome itself being blown completely over the mill. This explosion was attended with fatal consequences, and two other explosions, equally disastrous, had occured during the last few weeks. Neither were these two boilers under the inspection of this association, and had they been so, there is every reason to conclude that these lamentable effects might have been prevented.

Danger Signals for Railway Trains.—A simple, but ingenious plan for communicating between railway carriages and the guard of the train, in case of accident or danger, has just been patented by Mr. W. H. Muntz, of Millbrook Lodge, near Southampton. The apparatus consists of a rope, covered with leather, passing through metal tubes attached to each carriage, and supported to the roof by brackets, the tube being cut into lengths, so as to leave a small space over the centre of each compartment, to allow the hand of the passenger to grasp the rope. A metal hook, with steel springs, attached to the end of the rope of one carriage, links on to a metal ring secured to the rope of another carriage, just on the same principle as the ordinary coupling chains connect the different carriages of a train with each other. At each end of the rope a short distance from the hook or ring is a stop to prevent the rope passing into the tube when loose. In each guard's van a clock-bell is placed in a convenient position, near to which is attached a spring hammer. The end of the rope is then made fast to the lever of the hammer, so that, on the rope being pulled in any compartment of a carriage and let go again, it springs the hammer against the bell, giving the required signal. The rope may also be made to ring a bell of a similar description on the locomotive, thus warning the engineer at the same moment that it warns the guards at both ends of the train. Mr. Muntz, has also patented a plan of steam-breaks for locomotives, calculated to be of great service in case of danger. Attached to the side of the boiler is the steam-chest, supplied by a pipe from the boiler, and immediately under the stuffing-boxes is an iron frame, to which is fastened the wooden part of the break to fit the top of the wheel. In the piston-boxes, over the stuffing-boxes, are springs to raise the pistons and breaks off the wheels when not in use; these can be worked either by springs, balance-weights, or steam pressure. By this plan the engineer has full control of the engine in case of danger. He has only to turn the steam off the engine, and by pulling a handle he immediately puts the steam pressure on the breaks, either gradually by slightly drawing the handle, or the full power by drawing it out further. When not in use the handle of the valve is pushed in, and the steam let out of the chests by a small cock or blow-off pipe. By these two steam-chests, one on each side of the engine, they are instantly put in force, one break over each wheel, and also in heavy engines, if required, breaks can be worked on the track between the wheels, thus giving no less than 10 breaks on one engine, instantly in the power of the engineer.

Fairbairn's Tubular Crane.—Two powerful tubular steam cranes having been erected for the Government by Messrs. Fairbairn and Sons, of Manchester, at the gun-wharf adjoining Chatham Dockyard, both were recently subjected to a series of powerful tests, in order to obtain proof of their power and strength before being formally taken possession of by the Government. The experiments for testing the cranes attracted a great deal of interest. The largest of the two cranes is a fine specimen of mechanical engineering, and has been constructed of sufficient strength to sustain nearly double the number of tons that it will ever be required to bear. In order to carry the enormous weight thrown upon the foundation, excavations were made to the depth of nearly 30 feet, where a firm bed of concrete was laid, supporting a number of iron cylinders, each of 15 feet in length, the whole being bolted firmly together and surrounded with brickwork. The arm of the crane forms the segment of a circle of 25 feet radius, the whole being formed of wrought-iron half inch plates. By a simple contrivance it can be so adjusted that the crane may be worked by manual labour as well as steam, eight men being required to lift weights of 15 tons, while the nominal power of the engine when steam is used is 7 horse. During the experiments made on Friday the crane was first tested with a few tons' weight, which was gradually increased until a strain of 15 tons 7 cwt. was obtained, three of the heaviest guns on the wharf being raised with the greatest apparent ease. In order to show the perfect control of the engine, the guns were repeatedly raised and lowered with the greatest rapidity, while, by a simple contrivance, the weight was moved round to any required spot by means of a spur segment, on which the cranes travel. At the period of the heaviest strain it was ascertained that the deflection of the crane was only two inches, returning an inch and three-quarters when the weight was removed, leaving a quarter of an inch of settled deflection, or dead loss. Similar experiments were made with the second crane, the results of which were equally satisfactory to the officials who superintended the trials. The heaviest weight the largest crane will be required to lift in its ordinary work will be 10 tons, and the smaller somewhat less.

The Time Gun at Edinburgh.—Experiments for testing the best position of the signal gun, and the comparative range of audibility of various sizes of cannon and charges of powder have been recently conducted at the Castle, under the superintendence of Master-Gunner Finlay. The discharges, began at half-past 10 a.m., and were continued every hour till half-past 3 p.m. The first three shots of the six were fired from a 24-pounder, close to the flagstaff on the Half-moon Battery, and pointing in the direction of the Caltonhill, in order, as far as possible, to embrace equally within the range of its sound both the Old and New Town. The last three shots, beginning at half-past 1, were fired from an iron 18-pounder on the Forewall Battery, five or six guns to the north of the flagstaff, but pointing nearly in the same direction as the other. The first shot from the 24-pounder, with a charge of 6 lb. of powder, was not only audible, over the whole city, but, we learn, was distinctly heard by a gentleman standing at the gate of Dalkeith Palace. The charge of the second shot, at half-past 11, was increased to 8 lb. and the report in this case is stated to have been heard by another gentleman at Gallowshall toll, in the vicinity of Dalkeith. It was also heard by numerous gentlemen in their houses at the extreme north of the New Town, and at Newington, as well as by people in Leith, and it was the opinion of the gunners that it would likewise be easily heard in Burntisland. In the third shot the 6 lb. charge was reverted to. In the discharges from the 18-pounder only 4 lb. of powder were used; the reports were sharp and clear within a moderate distance, but we understand that in some quarters of the city they were either heard very indistinctly, or not heard at all. Probably, the experiments made will suffice to enable the gentlemen by whose exertions this matter has been carried forward to its present stage to decide as to the position and calibre of the gun to be used, and the weight of the charge. Arrangements are in the meantime being made for connecting the gun with the Royal Observatory on the Calton-hill and the time-ball on Nelson's Monument by means of an electric wire, and for preparing the mechanism by which it is to be fired. Already an electric wire (by means of which constant communication is kept up between the Edinburgh Royal Observatory and that at Greenwich) has been carried over the side of the Calton-hill to the North British Railway, and an estimate is being prepared by the Electric Telegraph Company as to the expense of carrying an insulated wire from this point over the house-tops to the Castle. It is anticipated that everything will be in working order within, at most, a month from this time, and that daily thereafter the inhabitants in every quarter of the city will be enabled, without leaving their houses or the avocations in which they may chance to be engaged, to set their clocks, and watches according to the correct Greenwich time. It is calculated that the annual cost of the audible time-signal will be altogether about £40.

Mineral Oil.—A Correspondent of the *Times*, gives the following interesting account of the American mineral oils. I am glad to find that petroleum, as a new item of American commerce, is likely soon to attract the notice in England its importance demands, and I write to define correctly the districts of its production, and to furnish some additional information. If you have Colton's or any other large map of Western Pennsylvania you will observe that the place called Union Mills is situated in Erie County, Pennsylvania, instead of New York State, and that Oil-creek, a branch of the Allegheny river, has its origin a few miles south of Union, and discharges its waters in the Allegheny, at the distance of about 30 miles. Ever since my earliest recollection (30 years or more), and for 'time whereof the memory of man runneth not to the contrary,' oil has been obtained from the surface of the water of Oil-creek in eddies, by spreading a woollen blanket on the water and then wringing out the oil, and been used for medicinal purposes, by external applications, for rheumatism, &c., and sold under the name of 'Seneca oil,' from the Seneca tribe of Indians, who at one time roamed over this part of the State. About 18 months ago a Mr.

Drake sunk a well at Titusville, an oil-creek, by way of experiment, to the depth of about 74 feet, and had the good fortune to strike a vein of oil, the product of which has yielded him a handsome fortune. His success incited others to make experiments, and the whole country for more than a hundred miles on the Allegheny river and along Oil-creek has been carefully examined, with the result that fortunes are being rapidly realized by many. I am not correctly informed as to the number of wells on Oil-creek, but they are numerous. At Tidionte, in Warren County, further up the Allegheny, 17 wells are in operation, producing not less than 10,000 gallons per day. There are probably a hundred wells more being sunk at Tidionte, and within three miles each way. The 'Crescent Oil Company,' an incorporation having their business office at this city, own a large tract of land at Tidionte, and are producing great quantities of oil. By the 1st of April next they will have at least 20 wells in operation. At Mecca, a small town in the eastern part of the State of Ohio, is a large tract of oil country, which is now being worked, in which the Aurora Oil Company are largely interested. Considerable quantities are also produced from wells on the little Kanawha River in North-western Virginia. The supply obtained, also, from a large territory on the Thames River, in Canada West, is almost fabulous. These several oil territories are favourably situated for getting the oil to market. From Titusville and Tidionte during the season of navigation the oil can be run down the river in flat boats to Pittsburg at a very low price. Tidionte is 14 miles from the railway; Titusville, 22 miles; Mecca, 9 miles; and the Canada oil lands, from three to 10 miles. The wells are mere holes in the ground, about six inches in diameter. They are dug by driving cast iron pipes, four inches inside diameter, to the rock, varying in depth from 10 to 60 feet. After finding a "good show" of oil, a pump is put in the well driven by steam, and the oil and water pumped into large vats holding a hundred barrels each, the oil rising to the top while the water is drawn off at the bottom. The crude oil is sold readily at 1s. 2d. to 1s. 4d. sterling per gallon at the well, and the barrels paid for extra. It makes a better light when refined than any other burning fluid I have ever seen—second only to best coal gas, with no liability to explode like many illuminating fluids that have been from time to time offered to the public. It is also in its raw state an excellent lubricator. The phenomena produced upon opening some of these wells are very singular. One opened at Tidionte a week ago spouted the oil and water to the height of 60 feet, forced by the gas, the generation of which seems at all times to be going on This new trade is worthy the attention of your oil dealers, and I hope will receive it. The supply seems inexhaustible. Wells that commenced pumping at the rate of 160 gallons per day, are now pumping six or seven times that amount, while a few, from which at their opening the oil was forced in large quantities by the pent-up gas, have fallen off; but if the pump is stopped a few days (as has happened by the breakage of machinery the oil commences to flow of its own accord. Most of the works are rude, and scarcely a well is worked to its capacity. Much of the oil territory is in the forest, the fuel for generating steam is green, and the whole thing is in its infancy. When a year shall have passed, and experience shall have taught owners and operators the true system to be pursued, the supply will be very much increased. The demand seems to augment with the supply. The refineries are not able to fulfil their orders, and it is scarcely used in the rural districts. I hope scientific men as well as dealers will turn their attention to it. It is understood here that large quantities of a similar product from the valley of the Irwady finds a market in London.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded November 5.

2708. Elijah F. Prentiss, Philadelphia, U. S.—A new detergent.
2890. Samuel M. Fox, New York, U.S.—Improvements in rails for railways, and in the wheels of carriages to run thereon, especially adapted to street railways.

Recorded November 13.

2784. Luigi Saccardo, Schio, Venetia—An improved apparatus and arrangement of paper for the substitution of this latter instead of the cards of Jacquard looms.
2786. William Clark, Chancery Lane—Improvements in looms.—(Communication from Benoit Barlet, Boulevart St. Martin, Paris.)

Recorded November 21.

2850. William Clark, Chancery Lane—Improvements in journal or axle boxes, for railway carriages, whereby to effect the better lubrication of the frictional surfaces. —(Communication from James H. Deming, Paris.)

Recorded November 24.

2880. Pierre C. H. Charbol, and Alexander Berson, Rue de Malte, Paris—Improvements in the making of cages and aviaries for birds.

Recorded November 26.

2894. George F. Train, Liverpool, Lancashire—Improvements applicable to street railway carriages, part of which are suitable for other purposes.—(Communication from Ralph N. Musgrove, Philadelphia, U.S.)

Recorded December 3.

2958. Richard E. Keen Old Change—Improvements in cocks, taps, valves, and other apparatus for stopping and regulating the flow of liquids, steam, and gas.

Recorded December 5.

2988. Constant J. Dumery, Boulevart St. Martin, Paris—A new or improved apparatus for extracting from water or any liquid the bodies in dissolution or in suspension contained therein.

Recorded December 10.

3031. William E Newton, Chancery Lane—Improvements in machinery for 'quartering' cork-wood, and for cutting the quarters into bottle corks.—(Communication from Alexander Miller, New York, U.S.)

Recorded December 14.

3080. Harry Barber, Belgrave, Leicester—Improvements in lamps used in mines.

Recorded December 17.

3099. Michael Henry, Fleet Street—Improvements applicable to fishing nets.—(Communication from Charles F. Lepage, Charles J. Pombla aine, and Alexis Seguineau, Boulevart St. Martin, Paris.)

Recorded December 18.

3104. Charles Stevens, Welbeck Street, Cavendish Square—A new mode of obtaining an article resembling honey, and to be used as a substitute therefor.—(Communication from Francois Vachon, Rue Laffite, Paris.)
3108. William Scholes, High Town, near Leeds, Yorkshire—Improvements in wire card-covering for carding wool, silk, flax, tow, cotton, jute, or other fibrous substances.
3113. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire —An improved compound felted and textile fabric.—(Communication from Iirbs Brothers and Company, Paris.)

Recorded December 20.

3128. Thomas Sykes, and Benjamin C. Sykes, Cleckheaton, Birstall, Yorkshire—Improvements in furnaces.

Recorded December 21.

3136. David A. Morris, Pittsburgh, Pennsylvania, U.S.—Improvements in the manufacture of sheet iron.

Recorded December 24.

3154. Peter Spence, Newton Heath, near Manchester, Lancashire—Improvements in separating copper from its ores.

Recorded December 26.

3160. Frederick Warren, Birmingham—Improvements in the machine used for cleaning cotton, and commonly called a 'churka' or 'roller gin'.

Recorded December 28.

3182. William E. Newton, Chancery Lane—Improved machinery to be used in the manufacture of paper.—(Communication from Heinrich Voelter, Heidenheim, Wurtemberg.

Recorded December 29.

3188. Jean L. St. Cyr, Auguste J. Grignon, and Philippe Rome, Paris—Improvements in manufacturing fibrous materials, tissues, or other fabrics.
3190. Laurent C. M. J. Vilcoq, Courbevoie, France—Improvements in apparatus or machinery for triturating textile bodies and other substances
3192. Humphrey Chamberlain, Wareham, Dorsetshire—Improvements in the preparation of clay for pottery purposes, which improvements are also applicable to filtering or cleansing liquids,

Recorded January 1, 1861.

4. Michael Henry, Fleet Street—An improved slide valve.—(Communication from Je B. E. Plainemaison, Boulevard St. Martin, Paris.)
5. Peter Campbell, India Terrace, West India Road, and Thomas A. Kendal, Cowley Street, Saint George's-in-the-East—Improvements in sails and apparatus used therewith.

Recorded January 2.

6. William Cooke, Charing Cross—Improvements in apparatus for ventilating.
8. John F. Belfield, Primley Hill, Paignton, Devonshire—Improvements in reaping and mowing machines.
9. Walter Morgan, Liverpool, Lancashire—The application of certain metals for the manufacture of 'coaling,' 'swill,' and similar baskets.
10. John Taylor, and Meshach B. Cooper, Liverpool, Lancashire—Improvements in the construction of rotatory engines.
11. Elizabeth B. West, Longford Terrace, Dublin—Improvements in the processes of making worts and washes in brewing and distilling, and in combination and adaptation of apparatus connected with the same, and for novel apparatus connected with the same.—(Communication from Edward F. Andrews, Versailles France.)

Recorded January 3.

12. Ponsonby A. Moore, Penge, Surrey—Improved feet for levelling clocks and other articles.
13. Charles Stevens, Welbeck Street, Cavendish Square—An improved apparatus for stopping run-away horses.—(Communication from Louis Marque, Rue Laffite, Paris.)
14. William C. Fuller, Bucklersbury, James A. Jaques, and John A. Fanshawe, Tottenham —Improvements in the adaptation of India-rubber and analogous gums, and compounds thereof, to valves, pump buckets, packing and other parts of steam, water, air, and gas engines and apparatus.
15. William Heywood, Ellesmere Street Works, Manchester—Improvements in machinery for grinding rollers and cylinders covered with card teeth.
16. Henry Doffegnies, Brussels, Belgium—Improvements in the process for obtaining pulp for the manufacture of paper from Indian corn, and other similar plants.
17. Alfred V. Newton, Chancery Lane—Improvements in the construction of air or gas engines.—(Communication from John C. Symmes, Berlin, Prussia.)
18. Samuel Perkes, Clapham, Surrey—Improvements in presses and modes of pressing, applicable to cotton, hemp, wool, coir, hides, hay, fibres, peat, linen, thread, piece goods, extracting oil, and other useful purposes.

Recorded January 4.

19. George Lowry, Salford, Lancashire—Improvements in machinery for heckling flax and other fibrous materials
21. James Wright, Bridge Street, Blackfriars—Improvements in machines for forming the heels of boots and shoes —(Communication from E. F. Green, Massachusetts U.S.)
22. Prosper Pimont, Rouen, France—Improvements in apparatus for drying fabrics and other articles.
23. William H. Hore, Liverpool, Lancashire—Improvements in machinery or apparatus for measuring and registering the lengths of woollen, flax, cotton, and other fabrics, applicable to registering lengths, distances and revolutions generally.

24. James Crocker, Liverpool, Lancashire—Improved apparatus for indicating the number of persons, vehicles, or articles passing, or being made to pass, any place or part of a machine, especially applicable to omnibuses.
25. Andrew Fairbairn, Leeds, Yorkshire—An improved construction of forging press or hammer.—(Communication from John Haswell, Vienna.)
26. James R. A. Douglas, Hounslow—An improved mode of roughening the shoes of horses and other animals, to prevent them from slipping in frosty weather.

Recorded January 5.

27. Louis C. E. Vial, Paris—Improvements in the manufacture of colouring matters and pigments from coal oil, raw naphthaline, and from the waste lime from gas works.
29. John Watson, Glasgow, Lanarkshire, and Charles F. Halle, Manchester, Lancashire—Improvements in spinning or twisting fibrous materials.
30. Henry Gilbee, South Street, Finsbury—Improvements in sewing machines.—(Communication from Jacques M. C. Debras, and Gabriel L. Bongard, Boulevart Bonnenouvelle, Paris.)
31. William E. Gedge, Wellington Street, Strand—Improvements in obtaining motive power.—(Communication from Main Gullon, Fontenay le Comte, Vendee, France.)
32. Bevan G. Sloper, Hackney—An improved method of, and machinery for amalgamating, and for effecting the separation of gold from earthy and other matters containing the same.
33. John Sugden, John Midgley, and William Clapham, Keighley, Yorkshire—Improvements in the construction of covered rollers used in machinery for preparing and spinning fibrous materials.
34. Lemuel, D. Owen, New Oxford Street—Improvements in bustles or skirt supporters—(Communication from W. S. and C. H. Thomson, New York, U.S.)
35. James Conlong, Belfast—Improvements in machines or engines employed for carding cotton, silk, flax, wool, and other fibrous substances.
37. John I. Grylls, Murton Street, Sunderland—Improvements in anchors.
39. John Hamilton, Glasgow, Lanarkshire—Improvements in govenors for regulating the speed of steam and other engines.
40. William Luck, Mabledon Place, Burton Crescent—An improved table, or article of furniture.

Recorded January 7.

41. William Taylor, Nursling, near Southampton, Hants—A portable horticultural and arboretical fruit, flower, and plant protector.
42. George D. Mease, East Jarrow, South Shields—Improvements in the manufacture of sulphuric acid, and also in separating copper and silver from their ores.
43. William Bagley, and William Mincher, Birmingham, Warwickshire—Certain improvements in coating metals and alloys of metal.
44. William Bagley, and William Mincher, Birmingham, Warwickshire — Certain improvements in coating metals and alloys of metals.

Recorded January 8.

45. William Clark, Chancery Lane—Improvements in filters.—(Communication from Jules P. A. Havard, Boulevart St. Martin, Paris.)
46. William Rattray, Aberdeen—Improvements in preserving organic substances.
47. Hermann Hirsch, Berlin, Prussia—Improvements in insulating the conducting wires used for telegraphic purposes.
48. Pierre E. Chassang, Rue du Conservatoire, Paris—An improved buckle.—(Communication from Simon Ghidiglia, Rue des Fontaines, Paris.)
49. George Hallett, Broadwall, Lambeth, Surrey, and John Stenhouse, Rodney Street Pentonville—Improvements in the manufacture of pigments for coating surfaces
50. Joseph J. Welch, Cheapside—Improvements in scarfs and cravats.

Recorded January 9.

51. Edward Lord, and Robert Whitaker, Todmorden, Yorkshire—Certain improvements in machinery for preparing, spinning, and doubling cotton and other fibrous substances.
52. Daniel Adamson, Newton Moor, Chester—Improvements in steam engines.
53. William Taylor, Nursling, near Southampton, Hants—A combined heating and ventilating pipe, to be made elliptically or otherwise.
56. Edward C. Shephard, Victoria Street—An improved apparatus for carburetting gas for gas lighting.
57. Charles S. Dawson, Thames Ditton, Surrey—Improvements in rotary engines, applicable to be worked by water, steam, or other fluids, also to be used as a means of raising and forcing fluids.—(Communication from William Kennish, New York, U.S.)
59. William E. Gedge, Wellington Street, Strand—An improved buckle.—(Communication from Jean Tissinier, Toulouse (Haute Garonne), France.)

Recorded January 10.

61. Michael F. Halliday, Langham Chambers, Langham Place—An improved trigger for gun locks.
62. Stephen Moulton, Bradford, Wilts—Improvements in the manufacture of India-rubber, applicable to springs, valves for machinery, and other purposes.
63. Richard A. Brooman, Fleet Street—Treating lava and other volcanic substances, in order to fit them for employment in certain arts and manufactures.—(Communication from Pierre A. Collard, Bas, France.)
64. Charles Newsome, Coventry—Improvements in looms for weaving ribbons and other fabrics.
65. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in tanning hides and skins.—(Communication from Samuel Dunseith, Philadelphia, Pennsylvania, U.S.)
66. James Conry, Manchester, Lancashire—Improvements in apparatus for communicating between the passengers and guard and guard and engine-driver on railways.
67. Charles H. G. Williams, Regent Square, Gray's Inn Road—Improvements in the manufacture of dyes and colouring matters.
68. William Longmaid, Inver, Galway, Ireland—Improvements in hardening the surfaces of the rails of railways, and the surfaces of the tyres of railway wheels, and in charring the surfaces of timber to be used for railway sleepers, and other purposes.
69. Benjamin B. Hawse, Vermont, U.S.—A new and useful or improved machine either for supporting clothes, or other articles to be dried, or for other useful purposes.

Recorded January 11.

70. Charles Senior, Huddersfield, Yorkshire—Improvements in machinery or apparatus for tentering or stretching and drying woollen or other textile fabrics, also for drying warps, yarns, or fibrous substances.
71. William C. Corsan, Sheffield, Yorkshire—Improvements in stoves, grates, or fire-places.
72. Henry T. Hooper, Killiow Kea, Truro, and William Gerrans, Tregony, Cornwall—An improved machine for distributing manure on lands.
73. Thomas Bromwich, Bridnorth, Salop—A combined apparatus for combing and cutting the hair of the human head.
74. William H. Muntz, Millbrook, Hants—Improvements in breaks for locomotive engines.
75. William H. Muntz, Millbrook, Hants—Improved means of signalling or communicating with the guard or engine-driver in railway trains.
77. William E. Gedge, Wellington Street, Strand—Improvements in weighing machines.—(Communication from J. C. Magg, Lyons, France.)
79. Thomas T. Chellingworth, Buckingham Street, Adelphi, C.E., and Jonathan Thurlow, Belvedere Road, Lambeth—Improvements in traction engines.
80. William H. Moran, Cologne—Improvements in gas meters.
81. Henry Pawson, Leadenhall, Street—Improvements in scale beams and weighing machines.
82. Alphonse R. le M. Normandy, Odin Lodge, Kings Road, Clapham Park, Surrey—Improvements in connecting gas and other pipes.
83. Nathan Ager, Upper Ebury Street, Pimlico—Improvements in stoves and ranges.
84. Alfred M. Foote, New York, U.S.—An improved lock for receiving and securing umbrellas, canes, and similar articles.
85. William G. Woodcock, West Bromwich, Staffordshire—Improvements in wrought iron beams or girders and columns.
86. Robert Smellie, West Merrieston, Lanarkshire—Improvements in apparatus for supporting and working sash windows and other similar sliding or traversing details.
87. Matthew A. Muir, and James M'Ilwham, Glasgow, Lanarkshire—Improvements in looms for weaving.

Recorded January 12.

88. William Bullough, Blackburn, Lancashire—Improvements in looms for weaving.
89. George Whight, Ipswich, Suffolk—Improvements in sewing machines.—(Communication from Theodore S. Washburn, Rochester, New York, U.S.)
90. Thomas Warwick, Birmingham, Warwickshire—Improvements in governors for steam and other engines.
91. Joseph Charlton, Manchester, Lancashire—Improvements in the method of directing the streams of water employed in extinguishing conflagrations, and in apparatus connected therewith.
93. Joseph Gibbs, Brentford—Improvements in constructing submerged works.
94. Henry Matheson, Lahore Terrace, Sydenham Road, Croydon, Surrey—Improved apparatus for generating steam.
95. Elijah F. Prentiss, Birkenhead, Chester—Improved apparatus for regulating the flow of gas, part of which is applicable to the valves of steam engines.—(Communication from D. H. Williams, Pittsburgh, U.S.)
97. Charles A. Girard, Boulevart du Temple, Paris—Improvements in preparing colouring matters for dyeing and printing.—(Communication from Georges de Loire, Paris.)
98. Giovanni Franci, Boulevart St. Martin, Paris—Improvements in cannon and mortars and in projectiles for the same.

Recorded January 14.

100. John Baldwin, jun., Charles Wood, and John Crossley, Halifax, Yorkshire—Improvements in machinery for combing wool or other fibrous substances.
101. Vincent Hall, Oxford Street—Improvements in obtaining colouring matters.
102. William Desilva, and Thomas F. Griffiths, Liverpool, Lancashire—An improved construction of instrument for taking observations at sea or on land.
103. Henry Clifford, Greenwich, Kent—Improvements in apparatus to be employed in coiling and paying out electric telegraph cables.—(Communication from Samuel Canning, at present on board the "William Cory," between Toulon and Minorca.
104. James Horsey, Belvedere Road, Lambeth, Surrey—Improvements in pouches or receptacles for tobacco and other articles.
105. Henry Weaher, New Maldon, Surrey—An improvement in window fastenings.
106. James Lark, Canal House, Strood, Kent—Improvements in the manufacture of Portland cement.
107. John H. Johnson, Lincoln's Inn Fields, and Buchanan Street, Glasgow, Lanarkshire—Improvements in machinery or apparatus for obtaining motive power.—(Communication from Jean J. E. Lenoir, Paris.)

Recorded January 15.

109. John Sidebottom, Harewood, near Mottram, Chester—Certain improvements in fire-arms and ordnance.
110. Joseph Willcock, Chancery Lane—Improvements in gas regulators.—(Communication from John Brunt, Rue Petrelle, Paris.)
111. John F. Spencer, Newcastle-upon-Tyne—Improvements in steam engines, and the machinery and apparatus connected therewith.
113. Charles B. Walker, Southampton Street, Strand—A novel mode of advertising, signalling, giving notices, or other communications.
114. Robert Wilson, Patricroft, Lancashire—Improvements in screw propellers, and in machinery or apparatus for actuating the same.
115. George Davies, Serle Street, Lincoln's Inn, and St. Enoch Square, Glasgow, Lanarkshire—Improvements in the manufacture of blades for knives, razors, swords, bayonets, and other similar articles, and in apparatus to be used in such manufacture.—(Communication from Andre Nadel, Paris.)
117. Michel Courniol, Libourne, Gironde, France—Manufacturing tallow candles supporting a heat of 28 degrees, without greasing or adhering, and extracting from the moulds whatever may be the atmosphere every two hours.
118. Alfred V. Newton, Chancery Lane—Improvements in the construction of railway and other carriages.—(Communication from Samuel J. Seely, Brooklyn, New York, U.S.)
119. Lucius A. Bigelow, High Holborn—Improvements in the construction of certain kinds of passenger carriages.—(Communication from Joseph Harris, jun., Roxburg, Massachusetts, U.S.)
120. James Picken, Birmingham, Warwickshire—Improvements in breech-loading fire-arms and ordnance.
121. Ebenezer Stevens, Cambridge Road, Bethnal Green—Improvements in machinery for preparing dough and paste.
122. Henry Sagar, Broughton, Manchester—Improvements in machinery for finishing patent tracing cloth and woven fabrics.

Recorded January 16.

123. William Coulter, Everton Road, Chorlton-upon-Medlock, Manchester—An invention for the use of joiners, cabinet makers, and others, called 'a bench hook.'
124. Edwin Whittaker, and Jeremiah Clare, Hurst, Lancashire—Improvements in machinery or apparatus for preparing cotton or other fibrous materials to be spun.
125. John Reading, Birmingham, Warwickshire—Improvements in swivels, or fastenings for connecting watches to watch chains, for fastening articles of jewellery, and for other like purposes.
126. Joshua W. Graham, Manchester, Lancashire—Certain improvements in machinery or apparatus for cutting, shaping, and dressing stone or other similar substances.
127. John Batley, Leeds, Yorkshire—An improved manufacture of belting.—(Communication from Charles Lezaire, Lille, France.)

128. John Telfer, Newcastle-upon-Tyne—Improvements in capstans and winches fo hoisting, which improvements are also applicable to the steering of ships.
129. Robert W. Swinburne, South Shields, Durham—Improvements in the manufacture of plate glass, and in furnaces employed therein.

Recorded January 17.

130. William Spence, Chancery Lane—Improvements in machinery for making butt hinges.—(Communication from William H. V. Gieson, Paterson, Passaic, New Jersey, U.S.)
131. Joseph H. Craven, Keighley, Yorkshire—Improvements in spinning and doubling wool, cotton, silk, flax, and other fibrous substances, and in machinery or apparatus employed for the same.
132. Marc A. F. Mennons, Rue de l'Echiquier, Paris—Improvements in apparatus and materials for filtering water and other liquids.—(Communication from G. Dardel, Mulhouse.)
133. George Lewindon, Bridport, Dorsetshire—Improvements in chimney and ventilating cowls.
134. Marcelin F. Cavalerie, Boulevart St. Martin, Paris—Improved apparatus for obtaining motive power by centrifugal force.
135. William Clark, Chancery Lane—Improved apparatus for raising fluids.—(Communication from Pierre, L. St. Clair, Paris.)
136. Edourd Jullien, Marseilles, France—Improvements in machinery for preparing and treating hides and skins in the manufacture of leather.
137. Michael Henry, Fleet Street,—Improvements in apparatus for locomotion, and in the construction of certain wheels employed therein, and of levels used therewith, such improved wheel and level being also applicable for other purposes.—(Communication from Jose Gallegos, Boulevart Saint Martin, Paris.)
138. John R. Jey, All Saints Street, Bristol—Improvements in machinery or apparatus for lithographic printing.

Recorded January 18.

139. Joseph Townsend, and James Walker, Glasgow, Lanarkshire—Improvements in mordanting, and in the manufacture of products to be used as mordants and otherwise.
140. Edward Argent, White Lion Street, Pentonville—Improved apparatus for lifting and tilting casks, or other receptacles containing liquids.
141. Isaac Bates, Dunkinfield, Cheshire—An improvement or improvements in apparatus for preparing warps for the loom.
142. Robert Mason, Alford, Lincoln—Improvements in apparatus for washing and churning.
143. John Jobson, Derby—Improvements in the manufacture of stove grates.
144. William E. Newton, Chancery Lane—An improved clutch apparatus for transmitting motion to various kinds of machinery.—(Communication from Colas Brothers, Paris.)

Recorded January 19.

145. Bernard Piffard, Caroline Villas, Kentish Town—Improvements in the preparation of nonconducting substances, for the deposition thereon of metals by electric action.
146. William Crozier, Findon Cottage, Witton Gilbert, Durham—Improved means of communication on railways for the prevention of accidents.
147. William A. Lyttle, Arundel Street, Strand—Improvements in, and connected with projectiles, to be used with ordnance, rifles and other fire-arms.
148. Frederick G. Sanders, Poole, Dorsetshire—Certain improvements in the construction of boxes for containing earth for growing shrubs or trees, which improvements are also for paving, flooring, building, and other purposes.
149. Robert M. Latham, Fleet Street—Improvements in the construction of children's rocking toys.—(Communication from David R. Smith, New York, U.S.)
150. Joseph Bond, Tow Law, near Darlington, Durham—Improvements in railway wheels.
151. Henry Vandercruyce, Bordeaux, France—Improved means or apparatus for lowering or striking the masts of ships at sea with sails and courses set.
152. Charles W. Lancaster, New Bond Street, James Brown, and John Hughes, Newport Monmouthshire—An improvement in constructing forts, screens, and other like defences.
153. James B. Rickards, Snow Hill—Improvements in the construction of axle boxes for the wheels of vehicles used on railways, applicable also to the wheels of vehicles used on common roads, for the purpose of reducing friction.—(Communication from Charles J. De Mat, Rue Saint Jacques, Paris.)
155. Michael Henry, Fleet Street—Improvements in machines for manufacturing corks, bungs, spiles, and such like articles.—(Communication from Paul A. A. Dalverny, Boulevart Saint Martin, Paris.)
157. William Clark, Chancery Lane—An improved device for balancing slide-valves of steam engines.—(Communication from Andrew Buchanan, and Peter Zeglio, New York, U.S.

Recorded January 21.

159. Charles E. Albrecht, Radnor Place, Hyde Park—Improvements in instruments or apparatus for indicating or measuring the pressure of steam and others fluids.
160. William Pickstone, York Street, Manchester—Improvements in trucks or waggons used for carrying coals.
161. John Scott, Michael's Place, Brompton—Improvements in rifles and their projectiles
162. William Pickstone, York Street, Manchester—Improvements in apparatus for discharging water from steam pipes.
163. Robert Mushet, Coleford, Gloucester—An improvement or improvements in the manufacture of cast steel.
164. Henry Hibling, Bloomfield Street North, Kingsland Road—Improvements in the manufacture of high boots, gaiters, knickerbockers, leggings, and other such like articles.

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 17th January, to 11th February, 1861.

Jan. 17,	4327	Alexander Grant & Bros., Clement's Court, Wood Street, Cheapside—"The alpha tie and collar."
18,	4328	John Clayton, Wolverhampton—"Air furnace for melting and refining iron."
18,	4329	John Cassidy, Dublin—"Crib-biting and wind-sucking preventor."
21,	4330	James Adams, 47 Alfred Road, Westbourne Park, W.—"Fire lighter making-machine."
28,	4331	Capt. Edward Walter, Army and Navy Club, S.W.—"The commissionaire's porte circular."
30,	4332	Lingham, Bros., Birmingham—"Sash fastener."
Feb. 11,	4333	Gray, Bailey, and Bartlett, Birmingham—"Lamp burner."
11,	4334	Francis Charteris, Lord Elcho, M.P., St. James's Place, S.W.—"The Elcho rifle-firing rest."
11,	4335	Robert Watson, 40 Walton Street, Chelsea, S.W.—"Break spring."

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